MAFTEX

The "Thermal-Insulating" Board that has Structural Strength

MANUAL

MAFTEX

The "Thermal-Insulating" Board that has Structural Strength

A PRACTICAL and complete reference guide for those interested in the effectiveness, economy and application of insulating material.

Compiled in collaboration with the

STRUCTURAL SERVICE BUREAU—D. KNICKERBACKER BOYD, F.A.I.A., *Consulting Architect*

MACANDREWS & FORBES COMPANY

200 FIFTH AVENUE, NEW YORK

A.I.A. File Number 37a1
1928

Licorice root being transported to one of the baling stations of MacAndrews & Forbes Company through the famous ruins of Ephesus.

INTRODUCTION

MAFTEX—The "Thermal Insulating" Board that has Structural Strength—offers the architect, builder and owner some very definite advantages in structural strength, insulating efficiency and economy.

Some of these outstanding advantages are that MAFTEX

—is composed of licorice root; a tough, fibrous undersoil growth that requires 4 to 5 years to mature.

—is a homogeneous mass of single-ply construction.

—has a thermal conductivity rating of 0.34.

—has a resistance to distortion much greater than wood when used as sheathing.

—has great nail holding power.

—has a bonding strength with plaster of over 1,000 pounds per square foot.

—replaces wood sheathing and lathing with less cutting and less waste.

—saves from 20 to 30% on fuel bills depending upon the type of construction.

Pelham-Biltmore Apartment, Pelham, N. Y.—MAFTEX structural insulating board used as plaster base and sound deadener on all main partition walls. MAFTEX Roof Insulating Board used on entire roof area for roof insulation.

Safinas (picturesque sailing boats) on the Tigris River loaded with licorice root, bound for the MacAndrews & Forbes Company's baling station at Basrah, Mesopotamia.

CONTENTS

MAFTEX

The "Thermal-Insulating" Board that has Structural Strength

Stacking freshly dug licorice roots at Sochia, Turkey.

CHAPTER I

THERE are very definite reasons for the unusual structural strength, insulating ability and economies of MAFTEX. These reasons can be, and have been, logically traced from the digging of the licorice roots to the service obtained from MAFTEX in actual installations.

Raw Material

From Spain, Italy, Greece, Turkey, Southern Russia, Asia Minor, Afghanistan and China come the tough licorice roots which compose MAFTEX —The "Thermal Insulating" Board that has Structural Strength.

Licorice Roots Naturally Tough

These licorice roots are a slow, undersoil growth and are not harvested for four to five years. Their mode of growth through stubborn soil necessarily makes them tougher than the fiber structures of growths that mature in three or four months. Their very life depends upon their ability to withstand moisture without disintegration. These inherent qualities of toughness and moisture-resistance found in the licorice root are found also in the finished product— MAFTEX.

MAFTEX used for third floor insulation in beautiful Wilmington (Del.) residence.
Walter Carlson, Wilmington, Delaware, architect.

Manufacture

The licorice roots are shredded and extracted, which includes boiling or "cooking" for hours to extract all of the useful non-fibrous material and to effect complete sterilization. Then they are further refined and cleansed of foreign substances, and finally the fibers are thoroughly waterproofed.

"Dead-Air" Cells Formed

The long, tough, reinforcing fibers are then passed through many presses that felt them into a closely compacted board containing millions of microscopic "dead-air" cells that check the passage of heat and form a continuous single-ply board without laminations. The board is then "seasoned" by drying at a temperature of 350°, cut into standard sizes, inspected, gauged and sent to the warehouse to be packed and shipped as MAFTEX— The "Thermal-Insulating" Board that has Structural Strength.

Properties of MAFTEX

MAFTEX Structural Insulating Board provides effective protection against thermal losses, due to its millions of "dead-air" cells, which are an effective barrier to the passage of heat.

MAFTEX always retains all its inherent qualities, so that it never buckles, cracks, warps nor disintegrates after being applied.

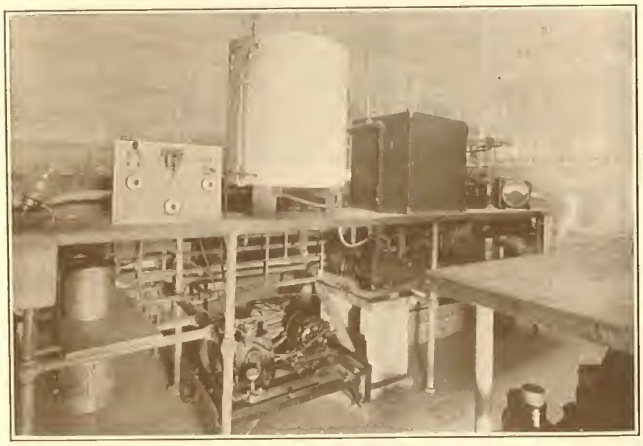
MAFTEX is thoroughly impregnated with a waterproofing material which makes it extremely resistant to moisture and non-absorbent to water.

MAFTEX STRUCTURAL INSULATING BOARD has the strength and resiliency to withstand windstrain, vibration and atmospheric change without the supplementary use of roof or side wall sheathing.

MAFTEX ROOF INSULATING BOARD is thicker than Structural MAFTEX and its insulating value is therefore somewhat higher. It is for insulating purposes only on flat roofs and similar locations where structural strength is not such an important factor.

MAFTEX is easily and quickly handled. It saws and nails cleanly, and greatly reduces construction time, effort and cost.

MAF-LATH has all the qualities of Structural MAFTEX—but is in more convenient size for use by lathers. It provides an excellent base for plaster in place of lath and requires no forcing of ground coats through to key.

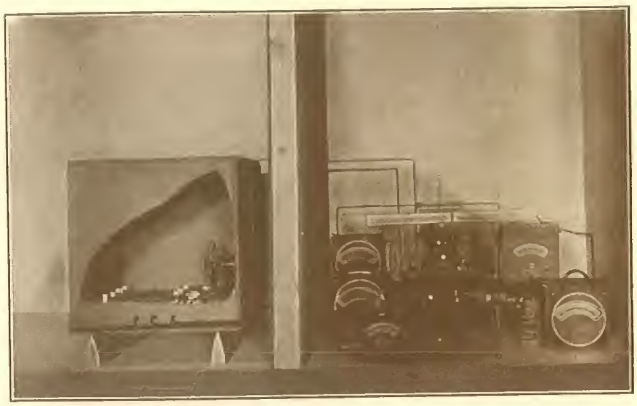


Complete Apparatus for Thermal Conductivity Test with the Guarded Hot-Plate in exact accordance with the code of A. S. H. & V. E.

MAFTEX Tests

For Thermal Conductivity

There are two well-known methods for testing the thermal conductivity of building materials—the "Hot Box" Method and the "Guarded Hot-Plate" Method.



Apparatus for the "Hot-Box" Method of testing conductivity.

Two Methods Used

Tests by both methods have been made a great many times to determine the insulating value of MAFTEX. Most tests at the present time are conducted by the "Guarded Hot-Plate" method, however, as this method is now universally accepted as the standard by all authorities.

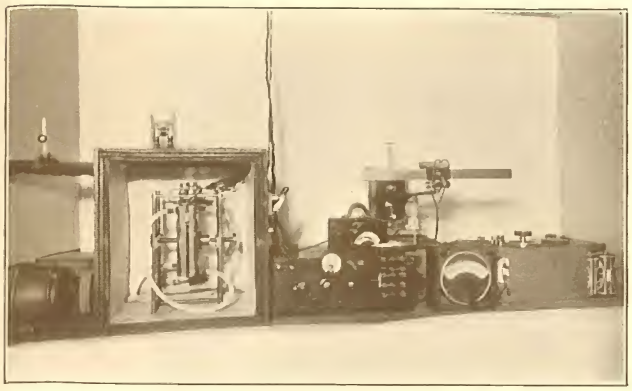
Daily Runs Tested

The daily runs of MAFTEX are tested by the latter method in the laboratories of the manufacturer. These tests indicate that a coefficient of 0.34 B.t.u. per hour, per square foot, per inch thickness, per degree Fahrenheit difference in temperature may be regarded as a conservative figure for MAFTEX.

Special Conductivity Tests

Professor G. F. Gebhardt, using the "Guarded Hot-Plate" Method, determined the conductivity of MAFTEX to be 0.337 B.t.u. Professor William Allen Sloan in tests in the Mechanical Engineering laboratory of the University of Pennsylvania by the "Hot Box" Method, found MAFTEX to have a value of 0.326 B.t.u.

A twenty year old experimental board fabricated from licorice roots shows no trace of disintegration, no inherent change, no loss of tensile strength.



Apparatus for the "Guarded Hot-Plate" method of testing conductivity.

The accompanying table shows at a glance the comparative conductivity of various building materials. The conductivity (C) is expressed in terms of B.t.u. per hour, per square foot, per inch thickness, per degree Fahrenheit difference in temperature.

	C
MAFTEX	0.34
WOOD (ACROSS GRAIN)	
Cypress	0.67
White Pine	0.78
Mahogany	0.90
Virginia Pine	0.96
Oak	1.30
Maple	1.10
MISCELLANEOUS BUILDING MATERIALS	
Cinder Concrete	2 to 3
Building Gypsum	About 3
Plaster Board	2 to 8
Building Brick	3 to 5
Glass	5 to 6
Limestone	4 to 16
Concrete	6 to 9
Sandstone	8 to 16
Marble	9 to 24
Granite	13 to 28

One of the twelve vast warehouses for storage of licorice root at the Camden plant of MacAndrews & Forbes.

When it is borne in mind that the lower the conductivity the better the material for insulating purposes, it is easy to see the advantage of MAFTEX with its conservative rating for conductivity of 0.34.

For Strength

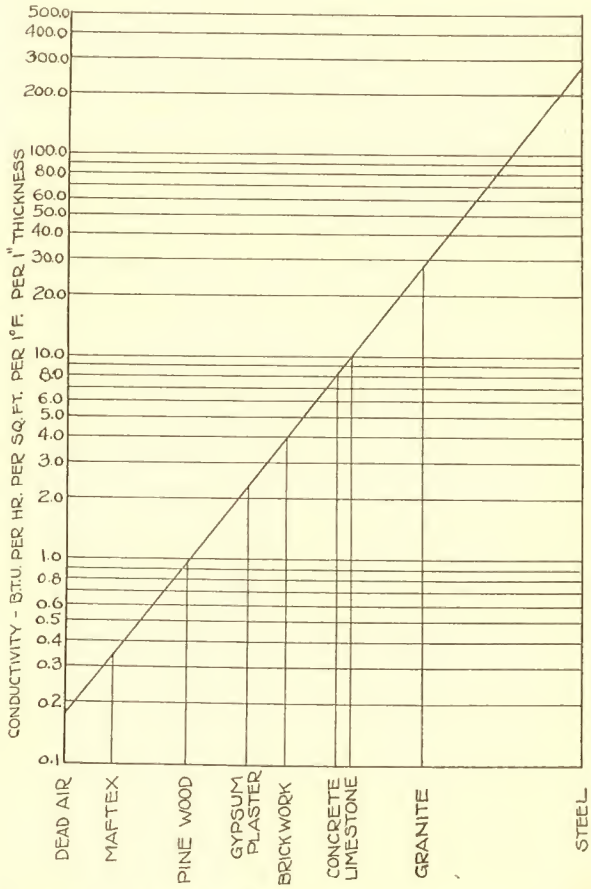
In addition to its insulating qualities, MAFTEX has unusual structural strength, as proved by numerous experimental tests and by actual service.

The greatest necessity for this structural value is of course in the construction of wood frame buildings, where sheathing acts as an integral part of the structural support—stiffening and bracing the wood studs, joists and rafters.

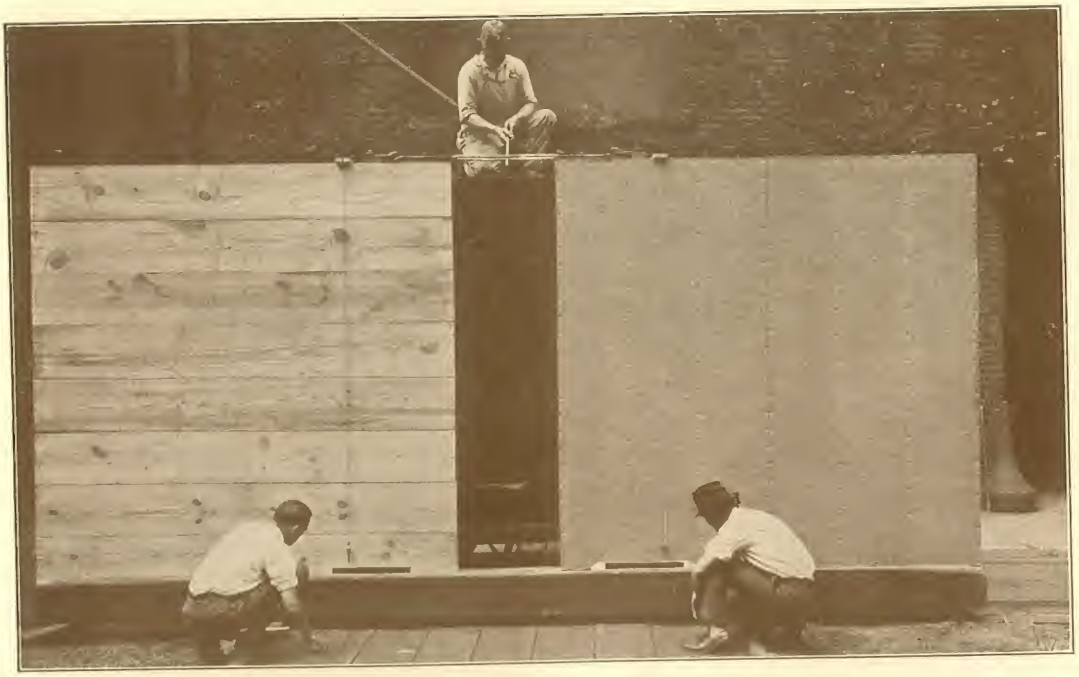
MAFTEX Compared with Wood

In this connection it is interesting to note the comparative strength for sheathing of wood and MAFTEX, as indicated by the turnbuckle test shown in the illustrations on the next page.

When subjected to the same loading, the displacement of the wood panel was more than 5 times as much as the displacement of the MAFTEX. When the turnbuckle was released, the MAFTEX recovered 54 per cent, whereas the wood sheathing recovered 17 per cent. This latter result is of particular interest when taken in connection with the



A comparison of the MAFTEX coefficient of conductivity of 0.34 with other materials quickly reveals the insulating value of MAFTEX.



START OF DISTORTION TEST on a panel of MAFTEX and a panel of wood sheathing. Each of the panels was 8 feet square. The studs were placed 16 inches on centers. One panel was sheathed with MAFTEX nailed in accordance with manufacturer's directions. The other panel was covered with ordinary 7/8 inch wood sheathing 12 inches wide with each board nailed to each stud with four 8d nails. A turn-buckle at the top provided an absolutely equal pull on each of the panels.

initial distortion, as it is convincing evidence of the extreme elasticity and resistance to strain of MAFTEX.

Diagonal Sheathing Tests

Similar tests were run on panels of MAFTEX and diagonal wood sheathing—with the sheathing laid sloping diagonally toward, as well as away from, the MAFTEX panel. The results showed that the MAFTEX panel has practically the same or even a slightly greater strength than diagonal sheathing. As pointed out on page 16 diagonal sheathing is not good practice and should not be used, particularly for stucco.

Nail Holding

One of the most interesting tests to determine the nail holding power of MAFTEX is shown in the illustration. It took a 250 pound pull before the four 6-penny nails with 1/4" heads gave way. Three nails were pulled from the wood block, while the head of only one nail was pulled through the

NAIL HOLDING TEST

A ten inch square of MAFTEX was nailed to a slab of seasoned wood with four 6-penny nails having 1/4" heads. The nails were spaced four inches apart on centers and the MAFTEX bolted to a block base. The load was applied by a chain hoist and it was not until the test scales recorded a 250 pound pull that the nails gave. Three nails were pulled from the wood while the head of only one nail was pulled through the MAFTEX. Naturally this was a vastly greater strain than would possibly be exerted in normal forms of construction, and is an excellent indication of the toughness of MAFTEX.

END OF DISTORTION TEST. After the turn-buckle had been given eighty-four turns, the MAFTEX panel was only 2 5/16 inches out of plumb, whereas the wood panel was 12½ inches from the perpendicular. After the load was removed, the MAFTEX panel returned more than 54% so that it was only 1 1/16 inches off. The wood panel recovered only 17% so that it was still 10⅜ inches from plumb.

This extreme resistance to distortion and strain provides convincing evidence of the structural strength of MAFTEX.

PLASTER BOND TEST

A MAFTEX board was given the usual three-coat plaster surface. After the plaster was thoroughly seasoned, samples were cut out in four inch squares. These samples were then attached to blocks of wood by applying coatings of hot asphalt. Rings were fastened to the blocks and after the asphalt had hardened the sample was ready for test. A chain hoist with test scales was used to apply the load. In repeated tests it has been found that a load of over one thousand pounds to the square foot did not affect the bond between MAFTEX and plaster—but that it was the MAFTEX itself which ruptured. Such tests are a wonderful demonstration of the strength of not only the bond but of the MAFTEX boards as well.

MAFTEX. This is of course a much greater strain than would possibly be encountered in normal forms of construction, and certainly provides excellent proof of the toughness of MAFTEX.

Plaster Bond

Extensive tests have been made to prove that plaster will adhere to, and form a strong, lasting bond with MAFTEX. The MAFTEX board was given a three-coat plaster surface in accordance with usual practice. The surface was thoroughly seasoned. In repeated tests (details of which are given under the illustration) it has been found that a load of over one thousand pounds to the square foot was required to cause a rupture. Then it was not the bond between MAFTEX and plaster, but the MAFTEX itself which ruptured. These tests proved not only the tremendous strength of the plaster bond but also the unusual strength of the MAFTEX board itself.

Bonding Strength Proved

As a means of determining the reason for this great plaster bonding strength photo-micrographs were taken of MAFTEX without plaster, and then

with plaster removed, so as to expose what had been the bonding surface. The results are shown in the accompanying illustrations.

They show how the gypsum plaster penetrated into the millions of valleys between the hills and into the craters formed by the licorice root fibers—and how the millions of tiny fibers on the surface of the MAFTEX board bonded with the plaster.

Resists 1000-Pound Pull

This penetration of the plaster into the minute holes in the surface, plus the fibers which were deeply buried in the plaster, account for the tremendous bond which even a pull of over a thousand pounds per square foot could not rupture.

Summation of MAFTEX Tests

These various tests to which MAFTEX has been subjected show—

(1) A thermal conductivity rating of 0.34 B.t.u.

(2) One-fifth the amount of distortion of wood sheathing under equal load—and a recovery of 54 per cent as compared with 17 per cent for wood sheathing.

(3) An ability to hold four nails up to 250 pounds pull—and then have only one nail head out of four pull through the MAFTEX.

(4) A plaster bond which did not rupture even though subjected to a pull of over 1000 pounds per square foot.

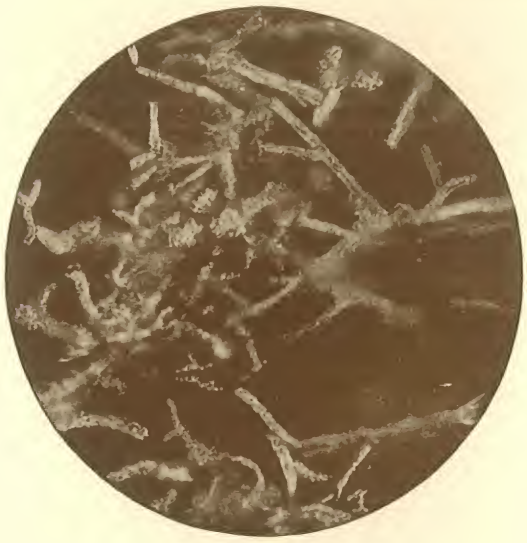


FIGURE 1

FIGURE 2

These Photo-Micrographs show the enduring bonding ability of licorice root fibers.

Fig. 1 shows the bonding surface of MAFTEX as it appears through the lens of a powerful microscope. Note the wiry, elastic, strengthening, licorice root fibers forming cave-like pits, hollows, and peaks, as they twist and turn and interlace. These make the MAFTEX bond.

Fig. 2—taken with the back of the MAFTEX scraped away almost to the bonding union—shows how plaster penetrates among the fibers, to key deep into the bonding surface, in and around and back of each tiny root fiber, forming millions of mechanical bonds that even repeated tests of 1,000 lbs. pull to the square foot fail to loosen. Bonding strength such as this might aptly be compared to the welding of metal.

MAFTEX used for entire roof insulation—Eton Hall Apartment, Scarsdale, N. Y.; Bagge-Murray Co., New York City, builders.

CHAPTER II

General Applications of

MAFTEX

There are of course many uses for MAFTEX in various types of construction, a few of which are explained in the following pages.

1. Roof Sheathing

MAFTEX replaces wood sheathing under the usual roofing materials and provides insulating value as well.

2. Side Wall Sheathing

On side walls MAFTEX is used in place of ordinary sheathing, thereby providing added strength and adequate insulation.

3. Plaster Base

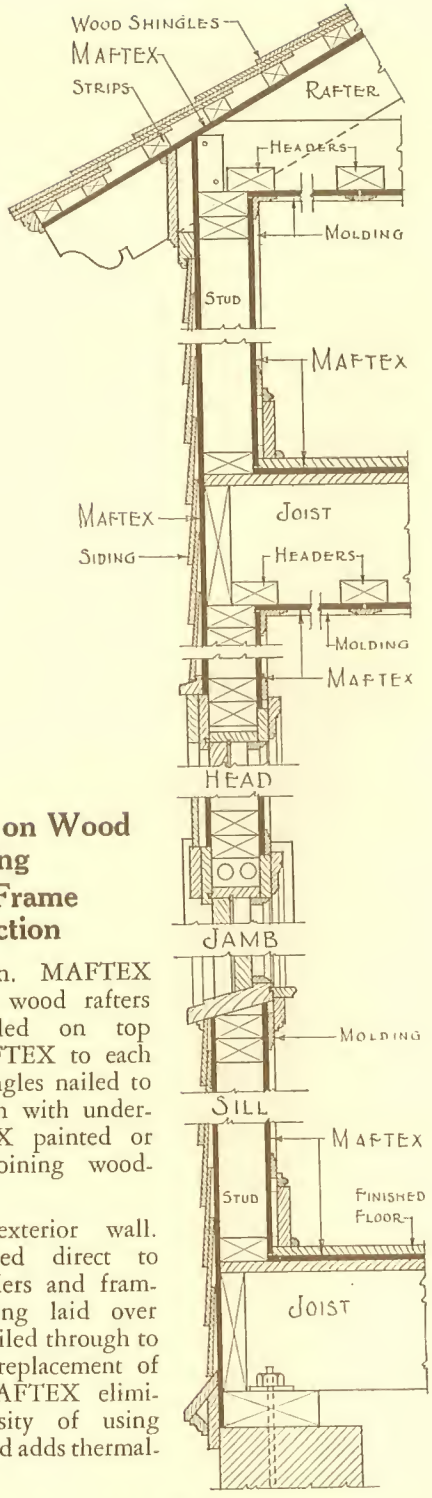
MAF-LATH (which is made exactly the same as MAFTEX, but of a different size) replaces wood lath, metal lath or plaster board on walls and ceilings. It provides a bonding surface of tremendous strength as well as preventing transmission of heat and sound.

4. Sound Deadening

MAFTEX, when used in partitions and floors, provides unusually effective sound-deadening.

5. Wall Finish

The rippled surface of MAFTEX forms an attractive finish in itself—and produces particularly beautiful effects when paints and stains are used on MAFTEX paneling.



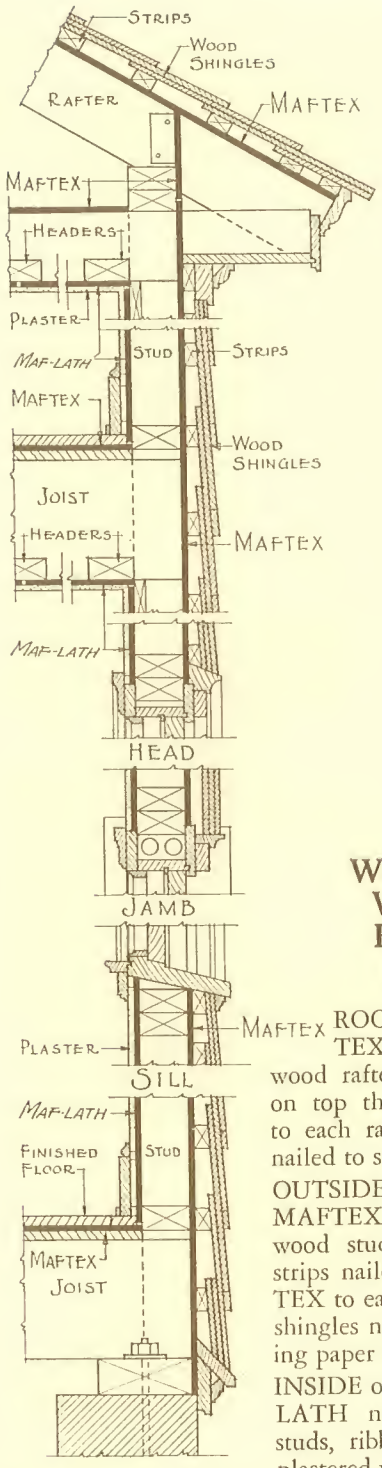
Wood Siding on Wood Framing
Western Frame Construction

ROOF construction. MAFTEX applied direct to wood rafters with strips nailed on top through the MAFTEX to each rafter. Wood shingles nailed to strips. Eaves open with underside of MAFTEX painted or stained like adjoining woodwork.

OUTSIDE of exterior wall. MAFTEX applied direct to wood studs, headers and framing. Wood siding laid over MAFTEX and nailed through to each stud. The replacement of sheathing by MAFTEX eliminates the necessity of using building paper and adds thermal-insulation.

INSIDE of exterior wall. MAFTEX nailed direct to wood studs and headers with wood mouldings covering the joints and forming panels. The same finish is used for the CEILINGS, SOFFITS and INTERIOR PARTITIONS.

FLOOR construction. First story, MAFTEX installed between rough and finished wood floors for thermal-insulation and to hush cellar sounds. Second story, same flooring method for sound deadening results.



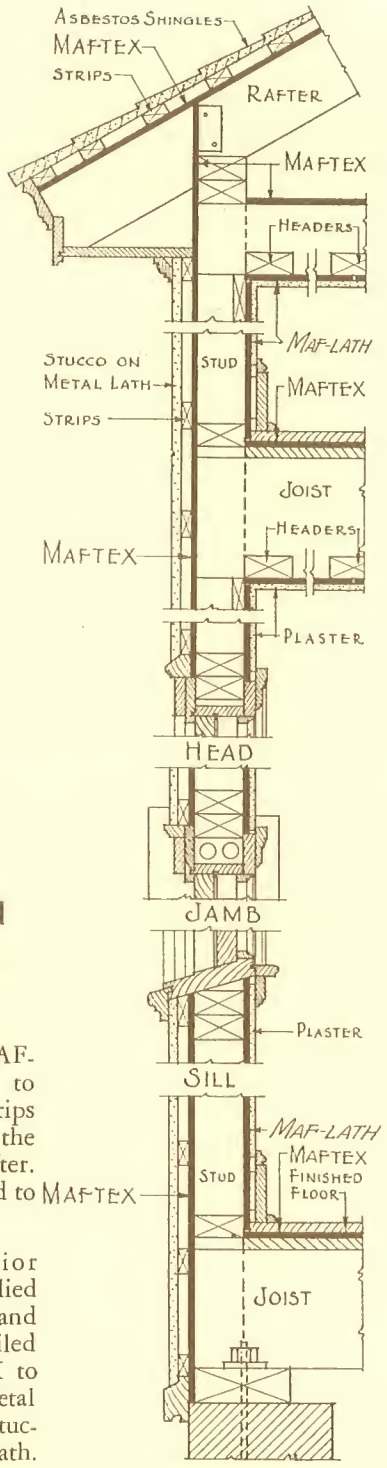
Wood Shingles on Wood Framing
Balloon Frame Construction

ROOF construction. MAFTEX applied direct to wood rafters with strips nailed on top through the MAFTEX to each rafter. Wood shingles nailed to strips.

OUTSIDE of exterior wall. MAFTEX applied direct to wood studs and framing with strips nailed through the MAFTEX to each wood stud. Wood shingles nailed to strips. Building paper eliminated.

INSIDE of exterior wall. MAFLATH nailed direct to wood studs, ribbons and headers and plastered with gypsum plaster, in accordance with the Basic Methods of Application, to afford thermal-insulation and serve as plaster base. Same method for CEILING, SOFFITS and INTERIOR PARTITIONS.

FLOOR construction. First story, MAFTEX installed between the rough and finished wood floors for thermal-insulation and to hush sounds from cellar. Second story, same flooring method for sound deadening results. Attic floor MAFTEXED for added thermal-insulation (and to hush attic sounds, if floored and used).



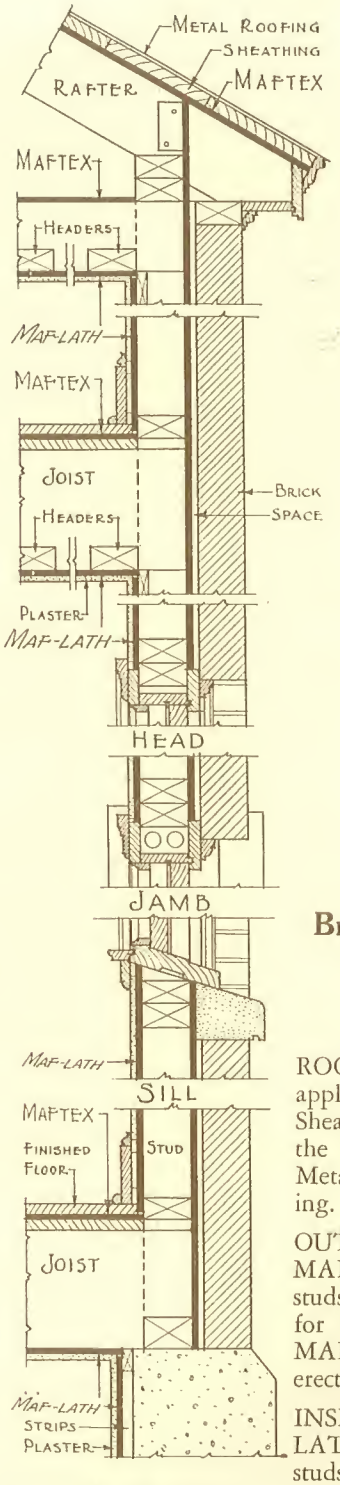
Stucco on Wood Framing Balloon Frame Construction

ROOF construction. MAFTEX applied direct to wood rafters with strips nailed on top through the MAFTEX to each rafter. Asbestos shingles nailed to strips.

OUTSIDE of exterior wall. MAFTEX applied direct to wood studs and framing with strips nailed through the MAFTEX to each wood stud. Metal lath nailed to strips. Stucco applied to metal lath.

INSIDE of exterior wall. MAF-LATH nailed direct to wood studs, ribbons and headers and plastered with gypsum plaster, in accordance with Basic Methods of Application, to afford thermal-insulation and serve as plaster base. Same method for CEILINGS, SOFFITS and INTERIOR PARTITIONS.

FLOOR construction. First story, MAFTEX installed between the rough and finished wood floors for thermal-insulation and to hush sounds from cellar. Second story, same flooring method for sound deadening results. Attic floor MAFTEXED for added thermal-insulation and to hush attic sounds.



Brick Veneer on Wood Framing Balloon Frame Construction

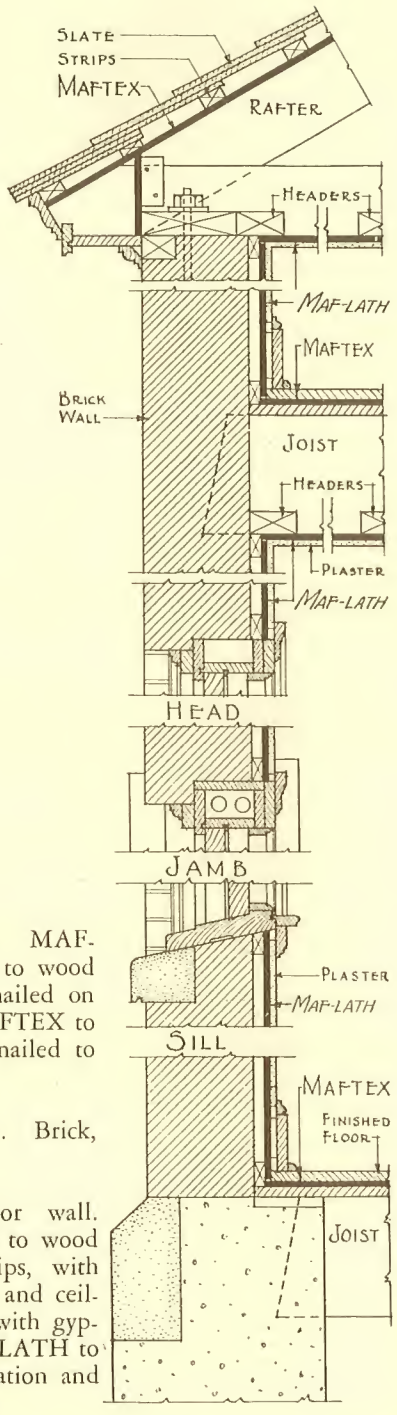
ROOF construction. MAFTEX applied direct to wood rafters. Sheathing nailed on top through the MAFTEX to each rafter. Metal roofing fastened to sheathing.

OUTSIDE of exterior wall. MAFTEX applied direct to wood studs and framing. Metal ties for brickwork nailed through MAFTEX to studs. Brick veneer erected as outside finish of wall.

INSIDE of exterior wall. MAF-LATH nailed direct to wood studs, ribbons and headers and plastered with gypsum plaster to afford thermal-insulation and serve as plaster base. MAF-LATH as plaster base in basement nailed to furring strips against masonry wall.

CEILINGS, SOFFITS and INTERIOR PARTITIONS. Same finish as inside of exterior wall above basement. Ceiling of basement the same.

FLOOR construction. First story, MAFTEX installed between the rough and finished wood floors for added thermal-insulation and to hush sounds from basement. Second story, same flooring method for sound deadening results. Attic floor also MAFTEXED.



Brick Wall

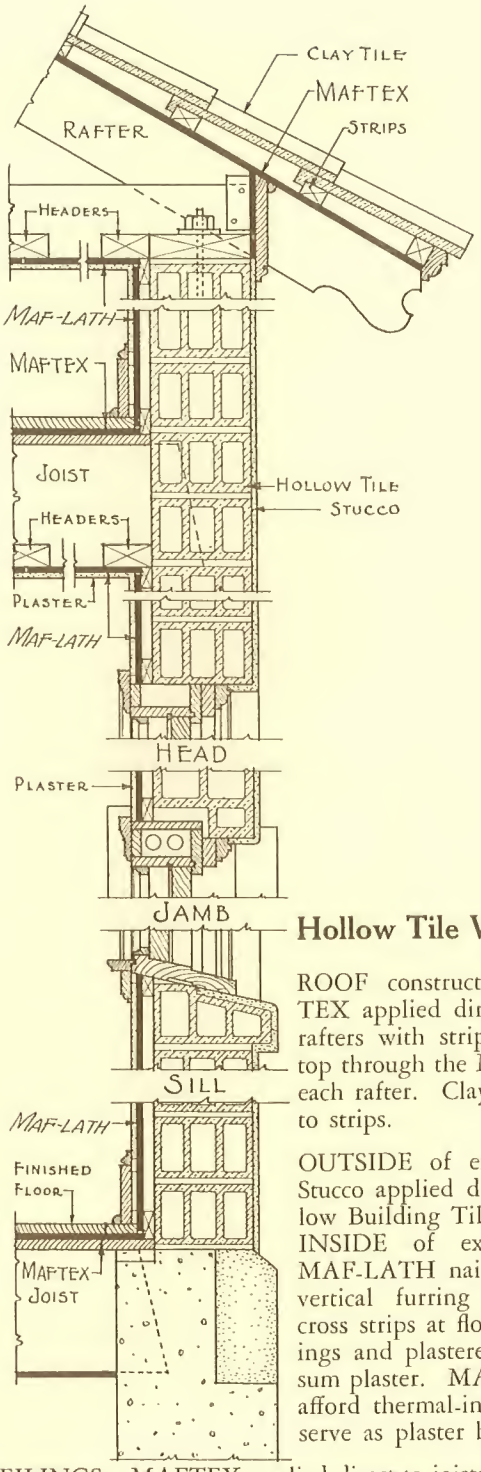
ROOF construction. MAFTEX applied direct to wood rafters with strips nailed on top through the MAFTEX to each rafter. Slates nailed to strips.

EXTERIOR WALL. Brick, solid.

INSIDE of exterior wall. MAF-LATH nailed to wood vertical furring strips, with cross strips at floor and ceilings and plastered with gypsum plaster. MAF-LATH to afford thermal-insulation and serve as plaster base.

CEILINGS of first and upper stories. MAF-LATH applied direct to joists and headers, as plaster base and plastered with gypsum plaster. All soffits and interior partitions, MAF-LATH applied to studs and framing as plaster base and plastered same as inside of exterior walls.

FLOOR construction. First story, MAFTEX installed between the rough and finished wood floors for thermal-insulation and to hush sounds from cellar. Second story, same flooring methods for sound deadening results.



Hollow Tile Wall

ROOF construction. MAFTEX applied direct to wood rafters with strips nailed on top through the MAFTEX to each rafter. Clay tiles nailed to strips.

OUTSIDE of exterior wall. Stucco applied direct to Hollow Building Tile.

INSIDE of exterior wall. MAF-LATH nailed to wood vertical furring strips with cross strips at floors and ceilings and plastered with gypsum plaster. MAF-LATH to afford thermal-insulation and serve as plaster base.

CEILINGS. MAFTEX applied direct to joists and headers of cellar, without plaster, as added insulation. Ceilings of first and upper stories. MAF-LATH applied direct to joists and headers, as plaster base, and plastered with gypsum plaster. All soffits and interior partitions, MAF-LATH applied as plaster base and plastered same as ceilings.

FLOOR construction. First story, MAFTEX installed between the rough and finished wood floors for thermal-insulation and to hush sounds from cellar. Second story, same flooring methods for sound deadening results.

MAFTEX used for entire roof insulation in fine Philadelphia residence.
H. Louis Duhring, Philadelphia, Pa., Architect.

CHAPTER III

MAFTEX

For Sheathing on Walls and Sloping Roofs

Value of Sheathing

STRICTLY speaking, there are two fundamental purposes of sheathing—for structural and for insulation values. In the first case the sheathing braces and stiffens the framework of the structure. In the second case it reduces the leakage of air into the building and the transmission of heat through the walls.

Insulating Value

In this connection it is interesting to note the statement that relatively less coal is burned in the northern states where winters are long and severe than in many of the southern states in which the cold season is short and mild. This condition is accounted for by the fact that buildings in the north are constructed to prevent air leakage and heat transmission, while in the south these factors have been neglected.

The United States Bureau of Standards has stated that one-half inch of insulation (having the same coefficient as MAFTEX) added to the roof and walls of the usual forms of construction may be assumed to cause from 20 to 30 per cent saving in fuel in dwelling houses.

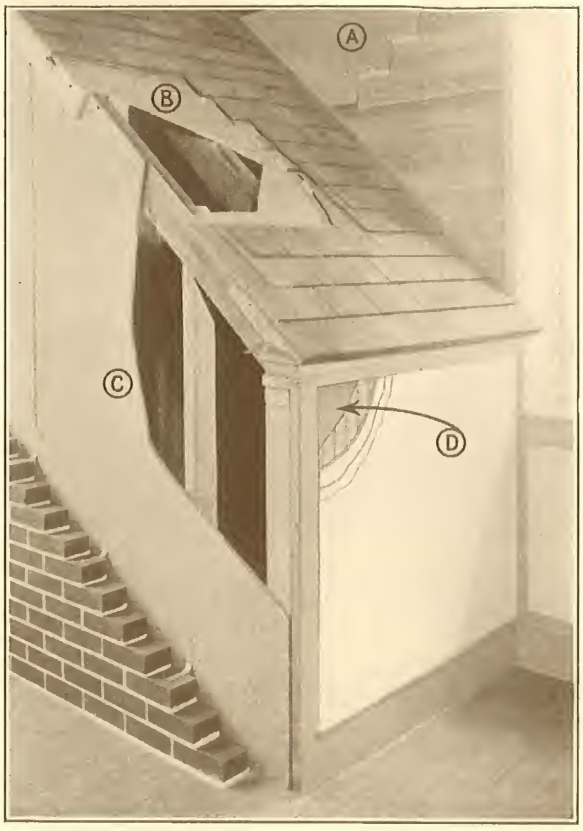
Tests also show that MAFTEX sheathed buildings are many degrees cooler in the summer.

Structural Value

The structural value of sheathing necessarily differs greatly in the construction of a wood frame building from that of a steel skeleton. With the wood frame the sheathing acts as an integral part of the structural support, stiffening and bracing the wood studs, joists and rafters—while in the steel skeleton the framework is not only self-supporting but the brick, stone or other materials used as a wall filling or coating are carried by the steel and therefore need not be of value structurally.

Horizontal vs. Diagonal Sheathing

Since this structural strength of sheathing is of such importance, it is essential to apply it in the most efficient manner. Many architects and builders have gone to the added expense of having sheathing laid diagonally across the studs. This undoubtedly in-



A. MAFTEX used as Sheathing under wood siding.

B. MAFTEX used as Roof Sheathing under wood shingles (note nailing strips).

C. MAFTEX used as Sheathing under brick veneer.

D. MAFTEX used as Sheathing under stucco.

creases the bracing strength in one direction on each side of the building—but actual tests have shown that the distortion due to shrinkage of diagonal sheathing is considerably greater than from horizontal sheathing. This is an especially important factor in stucco finished houses as such shrinkage is largely responsible for cracks and other damage.

Horizontal Sheathing Recommended

In 1915 and 1916 an elaborate series of stucco test panels was erected at the Bureau of Standards for the purpose of testing different types of stucco and stucco backgrounds. As the result of these tests it was proved conclusively that sheathing back of stucco should be laid horizontally and not diagonally. In 1920 the Committee on Treatment of Concrete Surfaces of the American Concrete Institute, in formulating its "Standard Recommended Practice for Portland Cement Stucco," stated the following in support of its recommendations that wood sheathing should be laid horizontally.

MAFTEX used on under side of roof as insulation and interior finish on Middletown Air Depot, Middletown, Pa.

Recommended Practice

* * * * * *

In sheathed construction the sheathing boards should not be less than 6 inches nor more than 8 inches wide, dressed on one or both sides to a uniform thickness of 13/16 inch. They should be laid horizontally across the wall studs and fastened with not less than two 8d nails at each stud.

Notes

When sheathing is used, it should be laid horizontally and not diagonally across the studs. The stucco test panels erected at the Bureau of Standards in 1915 and 1916 have demonstrated conclusively that diagonal sheathing tends to crack the overlying stucco by setting up strains in the supporting frame. This result is undoubtedly due to the shrinkage of the sheathing, and whatever benefit might be anticipated from the more effective bracing provided by diagonal sheathing appears to be more than offset by the shrinkage effect. Diagonal sheathing is also less economical than horizontal sheathing, both in material and labor.

Directions for Application of MAFTEX *As Sloping Roof and Wall Sheathing*

The standard basic method of applying MAFTEX for sheathing to studding and sloping rafters is the same in all cases. When MAFTEX is to be used for certain other purposes, the basic methods of application for sheathing still hold good, but there are sometimes other points which must also be given consideration. These are described in the additional directions which follow after the "Basic Method" is outlined.

Basic Method of Application

General Notes

These directions are based upon MAFTEX being applied "direct" to the exterior of studs and sloping rafters, replacing the ordinary sheathing or roofing boards. Experience and tests show that the structural strength and waterproofness of MAFTEX render unnecessary the use of sheathing or roofing boards and building paper or roofing paper. (See separate directions for applying various side wall or roof coverings over MAFTEX.) Wherever it may be desired, however, to apply MAFTEX as supplemental to sheathing or roofing boards, it will only be necessary to use ordinary 1 inch nails sparsely driven (nailing the center of the sheet first) to keep the boards in place until the side wall or roofing material is applied.

Notes as to Framing

All framing, such as studs (or furring strips), joists, and rafters for sloping roofs should be set in the usual manner and accurately spaced 16 inch on centers. At top and bottom ends of MAFTEX or wherever joints occur between sheets on studded walls, 2 x 4 inch headers should be nailed between the studding. The faces of studs, headers and rafters and the bottom of joists should be true and even.

Application

MAFTEX on the studding should be applied with the long dimension parallel to the framing and should have a solid bearing under all edges.

MAFTEX on the rafters of sloping roofs should be applied with the length of the sheets crossing the rafters. No headers are required at the cross joints as the stripping for the roofing material may occur over the joints thus closing them. When the stripping does not cover the joints, an extra strip should be inserted for this purpose.

Always allow ¼ inch clearance between boards at both ends and sides. The boards should never be forced against each other to fit into place. Where a tight joint is desirable with other materials, as around door frames, window frames, eaves and similar locations, the MAFTEX should be brought into close contact.

For nailing MAFTEX use large-head galvanized "roofing" nails 1½ inch in length. Beginning at the top or one end drive nails down the intermediate studs, joists, rafters or furring strips, spacing the nails 6 inches apart. Follow by nailing the top edge, bottom edge and last of all the side edges. Along all edges, the nails should be placed 4 inches apart and ⅜ inch from the edge. The nails should be driven until the head is slightly below the surface of the board.

Special Notes

Although the application of MAFTEX as sheathing for either sloping roofs or wall surfaces is a simple matter as described in the Basic Directions on Page 17, there are certain points in connection with its use in various locations and under various materials which should be emphasized.

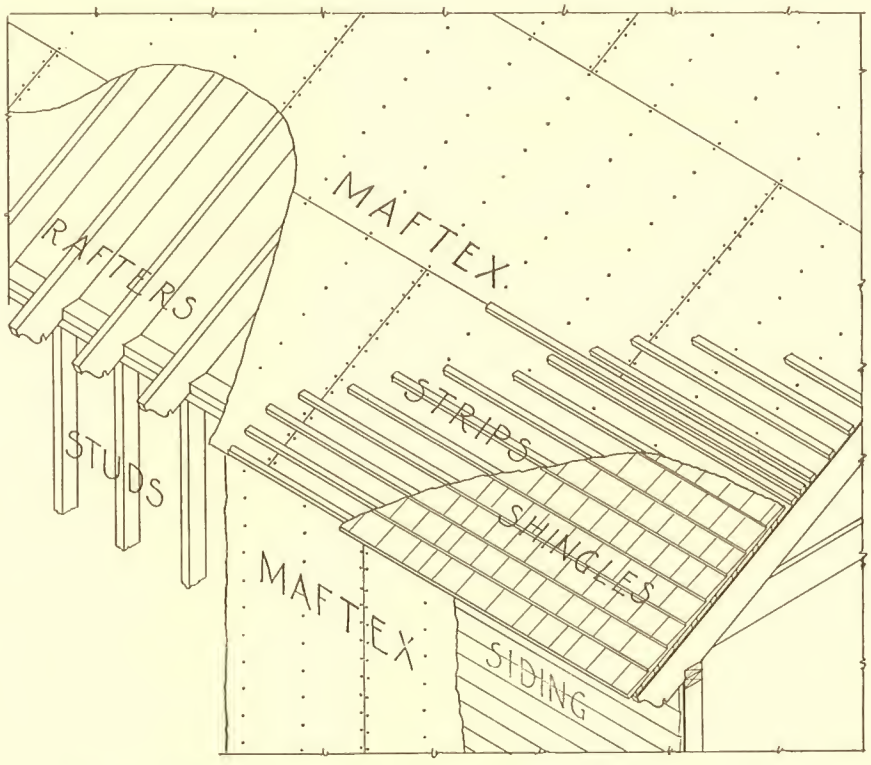
Sloping Roof Sheathing

One of the most important sources of heat loss from the average residence is the roof. Heated air rises and if, when it has passed through the lower ceilings and floors and reaches the roof, it does not meet with some obstruction, it will naturally pass to the outside air and its value will be lost to that house. This fact can readily be appreciated by noticing how fast the snow melts on the roof of the heated but uninsulated house in comparison with that on the roof of an insulated house.

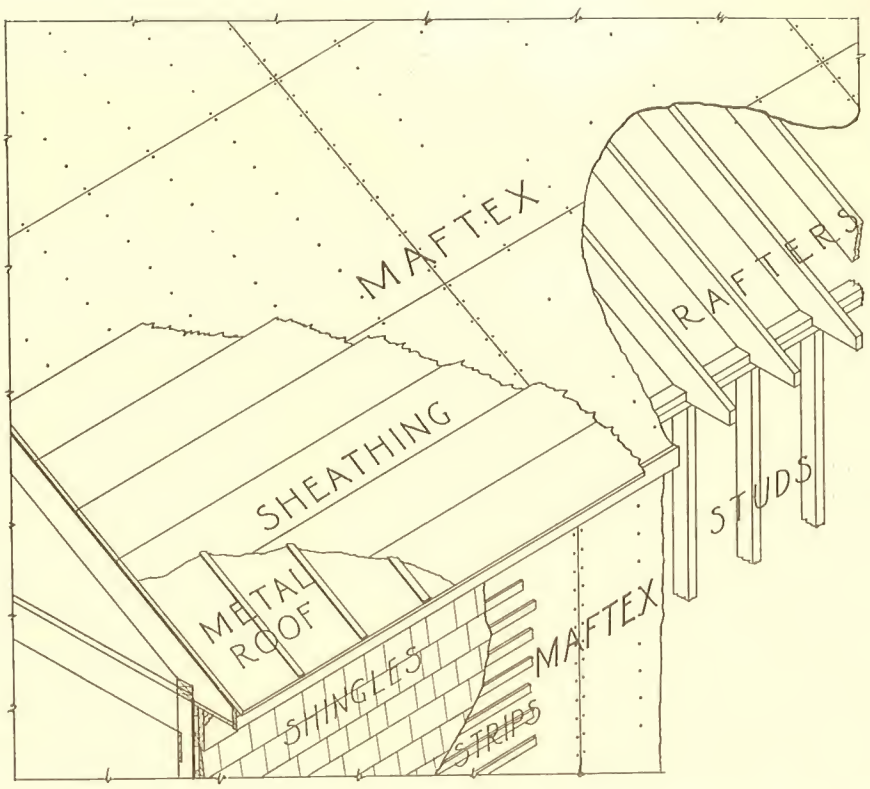
—for Wood Shingles

The illustrations clearly indicate the manner in which MAFTEX should be applied to the roof rafters. In the first drawing the MAFTEX is laid directly on top of the rafters and nailed to them in accordance with the Basic Directions. On top of the MAFTEX, and nailed through it to the rafters, are placed the ordinary shingle lath. These should be spaced to suit the "weathering" of the shingles. Where stripping does not cover cross joints an extra strip should be inserted for this purpose. The wood shingles are then nailed directly to the strips. It will be noticed that the MAFTEX extends out on the underside of the open eaves. Where so exposed it may be painted or stained like the adjoining woodwork.

The second drawing shows the usual wood sheathing applied on top of the MAFTEX as a base for the metal roofing. When this method is used, the nails for the sheathing should be a half inch longer than those ordinarily used to allow for the thickness of the MAFTEX.



Method of applying MAFTEX to roofs under wood shingles and to side walls under siding.



Method of applying MAFTEX to roof under sheathing and to side walls under wood shingles.

—for Other Roofing Units

For slate, clay tile or asbestos shingles the same method of applying shingle lath on top of the MAFTEX may be used as is shown for wood shingles. Of course, the lath should be properly spaced to accommodate the roofing materials.

If there is any prospect of delay or waiting for the slate, tile or other roofing materials after the MAFTEX has been laid on the roof, it is advisable to cover the MAFTEX with roofer's felt as would be done in the case of wood sheathing.

MAFTEX on Old Buildings

Although not shown in any of the drawings, MAFTEX may be used for insulating the roofs of old buildings by applying the boards on the underside of the rafters. The MAFTEX should be brought into close contact with the side wall sheathing or insulation and all possible points of air leakage covered. This is especially necessary around the eaves.

Wall Sheathing

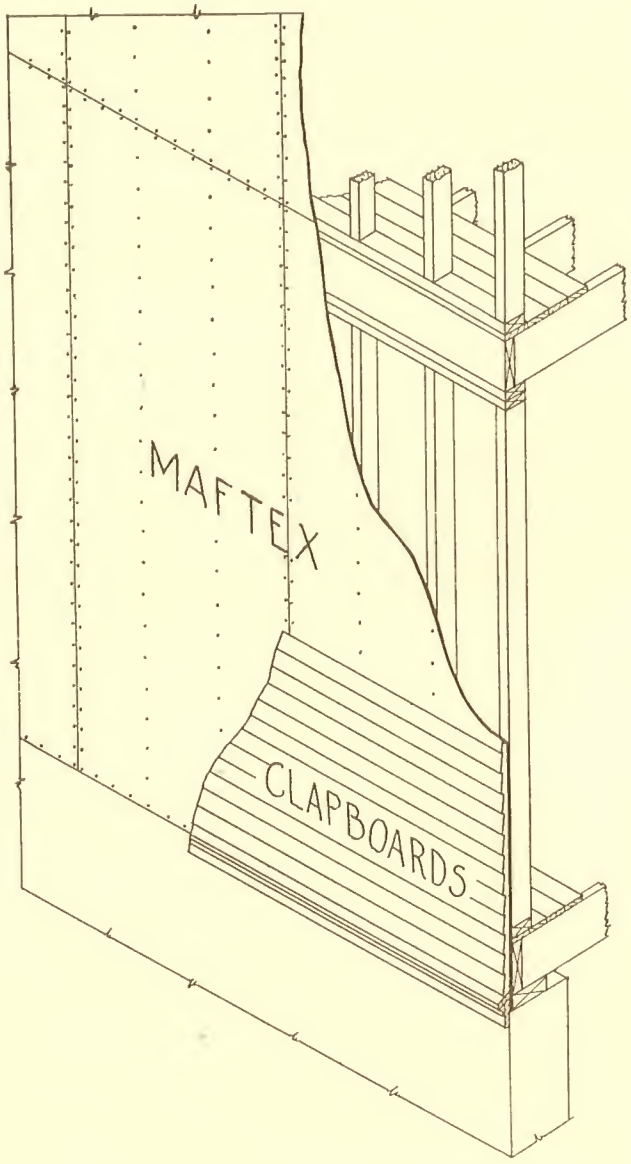
In applying MAFTEX as wall sheathing in place of wood under siding, shingles, stucco or brick veneer the Basic Directions give the essentials of the method of application. The following, however, calls attention to certain details shown on the above drawing and many of the same points will be noted on the drawings on the succeeding pages. The first will therefore be discussed in detail and the others only where they differ from this drawing.

MAFTEX Under Siding

In examining the drawing several interesting points will be noted. First, that the MAFTEX forms a close contact with the top of the foundation wall and the bottom nailing is into the sill of the structure. The header joist above the sill furnishes a substantial nailing and the rough floor runs through on top of this. The sill on top of the rough floor and the studs, 16 inches on centers, above are sheathed with MAFTEX in accordance with Basic Directions on Page 17.

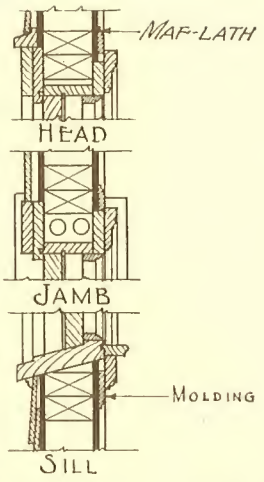
MAFTEX Around Window Boxes

As one of the most important sources of air leakage is around the window boxes, special attention is called to the construction and the method of installation of MAFTEX at this point. It will be noted that the MAFTEX is carried up closely under the sill, the headers furnishing the proper base for nailing. On the jambs MAFTEX is carried closely up to the box and nailed to the doubled studs. Here it is run back of the exterior window trim to secure an absolutely tight and airproof joint. At the head the MAFTEX is carried down back of the exterior head or drip moulding and up against the box member and nailed to the doubled headers.



Method of applying MAFTEX on side walls under clapboards.

Applying Siding



In applying the siding all joints must come over the studs to provide a secure nailing and nails ½ inch longer than usual should be used to allow for the thickness of the MAFTEX.

Where open eaves are used it is important that the MAFTEX be run up to form a close contact with the underside of the roof construction as this is one of the greatest sources of inleakage of air which has a cooling effect upon the whole structure. The MAFTEX should be cut in between the rafters to form a close joint with the roof sheathing and the plate. Small blocks of wood are nailed to the sides of each rafter to provide nailing for the MAFTEX.

MAFTEX Under Wood Shingles

When MAFTEX is used in place of wood sheathing under wood shingles, the MAFTEX is applied in the usual way as described in the Basic Directions on Page 17. This is shown on the isometric drawing on Page 19. It is important to see that it is nailed in accordance with the instructions and that it is run closely around the window boxes and door frames to prevent as much air leakage at these points as possible.

On top of the MAFTEX shingle lath should be placed and nailed through the MAFTEX to each stud. The spacing of the strips should be such that it will suit the "weathering" of the shingles. The shingles may then be applied in the usual manner.

MAFTEX Under Stucco

In the first drawing on Page 21, MAFTEX is used in place of wood sheathing back of the metal lath and stucco. Follow the Basic Directions for the application of MAFTEX as printed on Page 17 and see that the MAFTEX is carried closely against the window boxes and door frames.

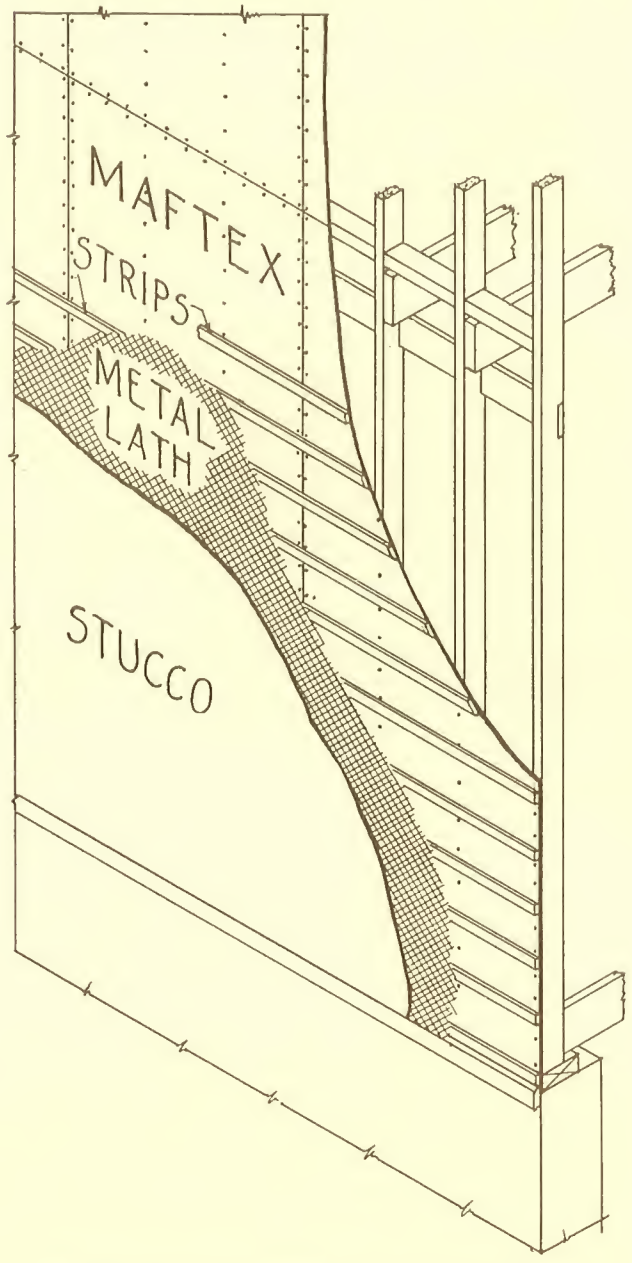
Over the MAFTEX apply furring strips nailed through to each stud. The strips should be placed properly to accommodate the lath to be used. The lath can then be applied to the strips and the stucco applied in the customary manner. If self-furring lath is used the furring strips are not required.

MAFTEX Under Brick Veneer

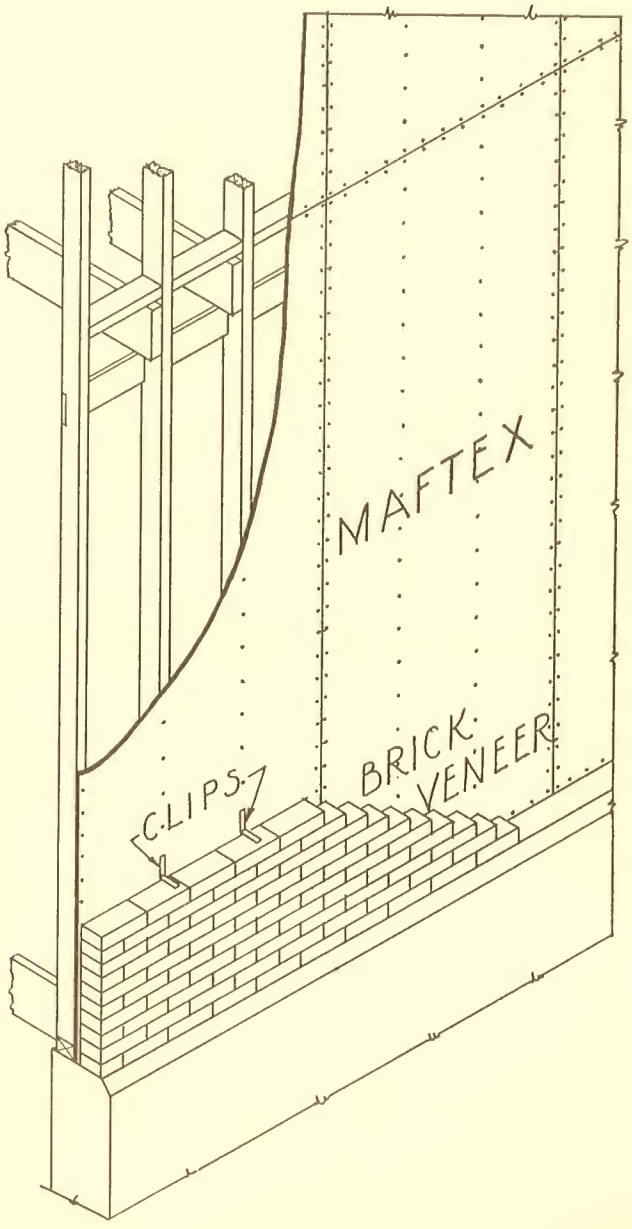
When MAFTEX is used in place of wood sheathing under Brick Veneer, it is applied to the wood frame in the usual manner as described in the Basic Directions on Page 17. The MAFTEX should be carried closely against the wood sill and the window box.

Metal ties or anchors for the brickwork are nailed through the MAFTEX to the studs at proper intervals to meet the brick courses. The brick veneer can then be erected as the outside finish of the wall in the customary way.

The MAFTEX should be run to the bottom of the roof construction to provide against air leakage.



Method of applying MAFTEX on side walls under metal lath and stucco.



Method of applying MAFTEX on side walls under brick veneer.

Stanwood Phillips, New York, architect.

R. Bruce Munro, Rye, N. Y., architect.

Two beautiful MAFTEXED homes on grounds of Westchester-Biltmore Country Club, Rye, New York.
H. S. Stevens Co., Inc., Rye, N. Y., builders.

MAFTEX used as sheathing under brick veneer.

MAFTEX used as wall sheathing under stucco.

Two residences in White Plains, N. Y.
George W. Osterhoudt, White Plains, N. Y., architect and builder.

The two lower homes, which are typical of moderate priced building operations, well illustrate the fact that MAFTEX can be economically installed on contracts where material and construction costs are of primary consideration.

MAFTEX used as interior finish, painted, in Scott Hotel, Oquaga Lake, N. Y.
Conrad and Cummings, Architects, Binghamton, N. Y.

CHAPTER IV

MAFTEX

For Interior Decoration

EVERY architect is sure to encounter situations which call for paneled treatments. Usually, of course, decorative effect is the principal objective, but there are other points to be considered in the choice of material employed.

Other Factors Considered

Insulation is one important point. Appreciation of the value of heat-proofing for interior walls and ceilings, as well as the exterior, naturally demands that paneling combine effective insulation with decorative surface quality.

Sound deadening is also important. Interior walls and ceilings that hush room-to-room sounds play a part appreciated quite as much as insulation. There is a decided advantage in paneling that effectively accomplishes this.

Endurance is still another point. Not only must the material have the desired texture and satisfying natural color; there should also be assurance of permanent rigidity, absence of curvature, buckling or distortion caused by thermal changes, vibration, and the normal contractions and expansions to which the structural elements of all buildings are more or less subjected should be minimized.

Further, there must be a high degree of resistance to atmospheric change, the effects of time, and the depredations of rats, mice and other vermin.

With all these qualities the board selected for interior decorative effects must be thoroughly "workable"—must be easy to handle, quick and efficient in its application, permit clean-edged saw cuts and solid nailing.

MAFTEX "Thermal-Insulating" Board fulfills each of these requirements and at the same time produces a pleasing gray-brown color and interesting ripple bonding surface that adapts itself so well to natural effects or applications of paint or surfacing compounds.

Decorative Effects With MAFTEX

For Interior Use

THE possibilities of using MAFTEX "Thermal-Insulating" Board to secure decorative effects on the interiors of residences, apartments, offices and practically all types of structures are, in a sense, limited only by the originality of the designer or decorator. Every structure, and in fact every room, is in itself a distinct and separate problem—and should be so treated by the decorator.

In some cases the boards may be left untreated, with their pleasing gray-brown surface exposed. This is economical and the neutral color of the boards furnishes a most satisfactory background for pictures and wall draperies. MAFTEX is usually paneled by applying strips of wood, or battens, over the joints and painting them to harmonize with the natural tone of the board. This treatment provides an inexpensive but most effective result.

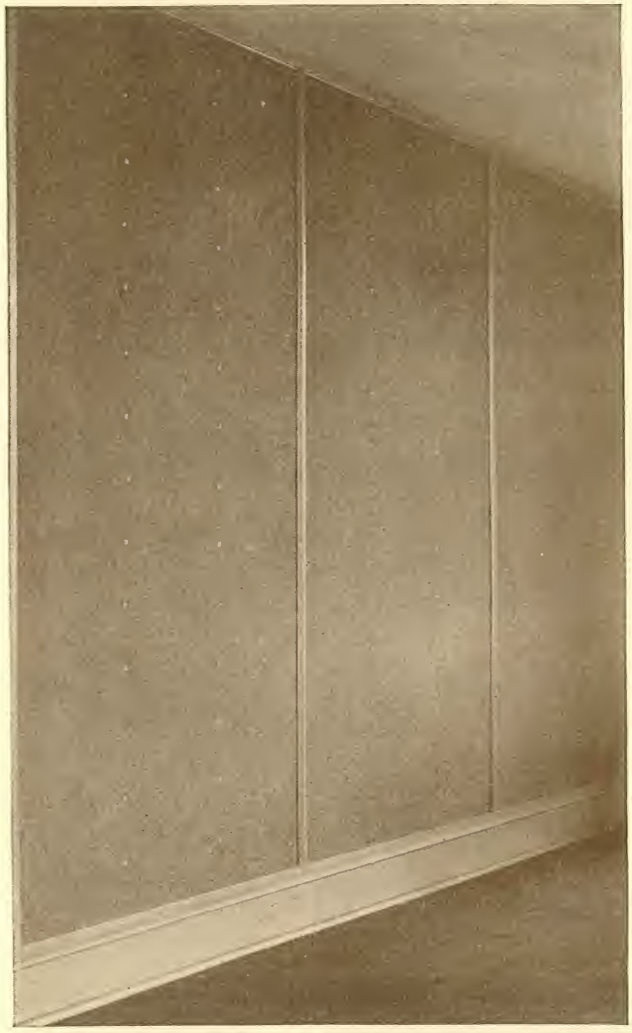


Fig. 3. MAFTEX paneling with natural rippled surface left unfinished. Molded battens of wood cover the vertical joints and miter with horizontal wood member at ceiling angle and bottom horizontal wood member on top of baseboard, forming large panels the full width of MAFTEX, or three studding spaces, and the full height of room. The ceiling shows MAFTEX applied direct to the joists and plastered.

As a modification of this method, the MAFTEX may be colored with paint, stain or kalsomine. When this scheme is adopted, battens or strips of wood may be colored to match or harmonize with the color used on the MAFTEX.

Stenciling with stains is a most pleasing variation of this method. Unusual and surprisingly beautiful effects can be secured with an ultimate result much like that of Japanese Grass Paper. The neutral background of the MAFTEX, when treated with stencil stains, allows the fiber structure of the board to show through and gives a soft and slightly "blurry" effect which is most attractive.

Special Surface Coatings

One of the latest developments in the field of interior decoration is the application of special surface coatings for smooth or textural effects on walls and ceilings.

These give most satisfactory results when applied to MAFTEX, forming a bond of unusual strength and endurance, as well as a surface that may be textured in any number of ways in accordance with the directions of the manufacturers.

MAFTEX also forms an excellent base for all types of wall coverings.

MAFTEX provides not only an excellent decorative material but also one which will provide a high degree of thermal-insulation. The strength of MAFTEX has been proven superior to that of wood sheathing in its resistance to twisting and distortion, and its use adds rigidity and stiffness to any structure.

For Exterior Use

MAFTEX "Thermal-Insulating" Board can be used successfully as an interior-exterior wall material for certain types of smaller structures—camps, summer bungalows, etc.—where insulation, interior attractiveness, and economy are factors.

For this use MAFTEX boards may be applied directly, and exposed, upon outside studs, with outside surfaces painted and interior surfaces treated in the manner described.

Paneled Walls and Ceilings of MAFTEX

IN its original form, paneling was actually half-timber construction. Framing of this character was of massive posts and rails, usually molded, and the panels were let into the framing.

Gradually the framing became of less and less structural value and was reduced in thickness. The panels were also reduced to a more convenient size. About 1650, when Inigo Jones designed his famous masterpieces, there was a remarkable change, large panels made up of several boards being glued together.* Three styles of paneling are common today —namely, English, French and Colonial. Each has, of course, many variations but in the broadest sense these may be said to be the most popular general types.

Present day paneling, although it follows in design and effect the rules laid down by precedent, is seldom constructed entirely of wood and almost never with the structural members exposed. Under modern conditions the use of MAFTEX "Thermal-Insulating" Board for paneled effects has become increasingly popular. And this is quite natural, for MAFTEX combines not only strength, rigidity and a high degree of heat savings in one material, but also assures pleasing and satisfactory surface decorative effects.

Important Principles

In applying MAFTEX as paneling there are a few important principles which should be borne in mind.

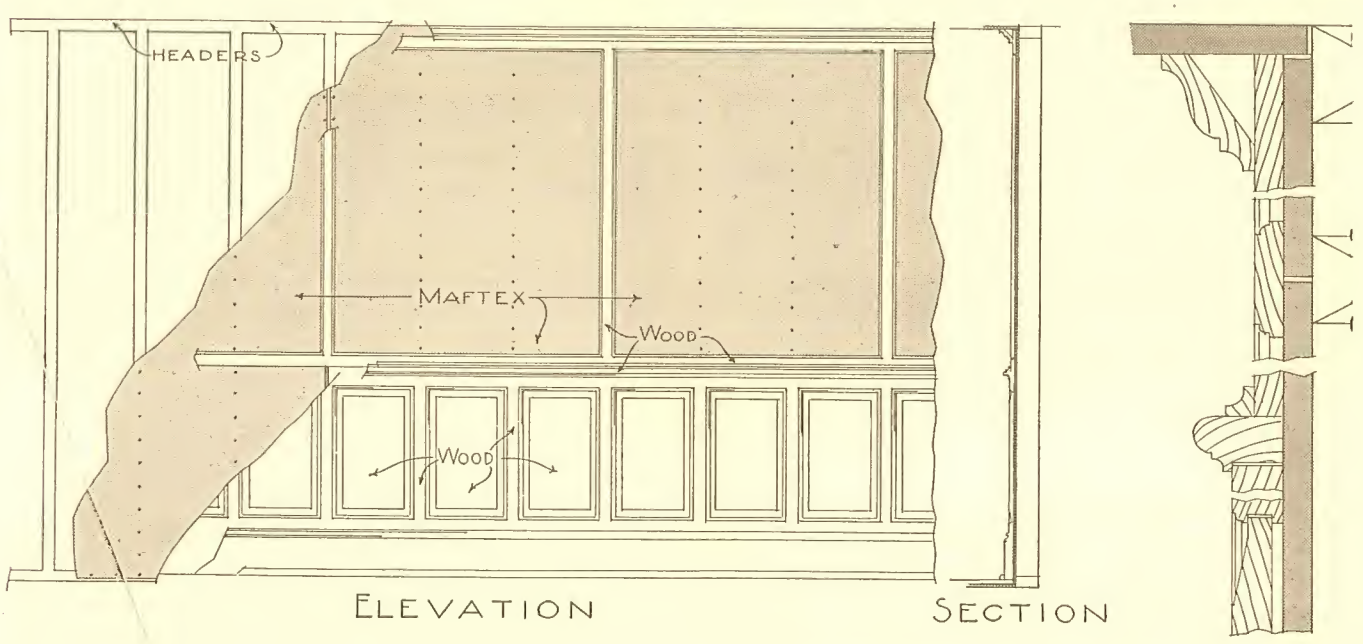


Fig. 4. MAFTEX applied directly to face of studs from floor to ceiling, thus insuring full insulation. Wood paneling is placed on the MAFTEX to the usual height of a chair rail, which may or may not correspond with height of window sills. The MAFTEX on upper portion of wall has wood battens over vertical joints mitering with horizontal wood members at top of wainscoting and at ceiling angle. The vertical lines of nailing on intermediate studs may be left with heads exposed or hidden from view, as described on following pages, depending on finished effect desired. The section and details at the side show MAFTEX used on the ceiling and under finished floor—for decorative effect and sound-deadening combined.

*For an excellent discussion of the development of Paneling see "A Short History of the Building Crafts" by Martin S. Briggs, F. R. I. B. A., upon which the above is based.

Fig. 5. MAFTEX used for long, narrow panels extending uninterruptedly from floor to ceiling, with molded wood battens not only over vertical joints but over each vertical line of nailing on intermediate studs, thus covering nail heads completely. The molded battens miter with the horizontal moldings at ceiling angle and baseboard, all woodwork and the MAFTEX being finished with oil paint of contrasting colors. The ceiling joists are left exposed with the MAFTEX under the floor above showing between the joists.

These are discussed below and the points brought out will prove of assistance to anyone contemplating this type of decoration.

Framing

A paneled wall is essentially made up of divisions of surface, which are emphasized by the application of moldings or battens. These battens may or may not be only those which cover the joints between the MAFTEX boards, but in any case they must have a secure nailing. It is, therefore, most important that the design and layout of the panels be determined before the studs are set, so that they may occur behind the molding. If, for any reason, this cannot be done, it will be necessary to insert extra studs or nailing pieces to provide a nailing base. Wherever there may be danger of unusual pressure of blows against the panels, as at chair rails, reinforcing headers should be inserted. Of course it is desirable according to expected occurrence of such jars to provide a "rail" in the paneling at that height.

Studs should never be placed more than 16 inches apart on centers, and any studs which are not straight and true should be made so by wedging or other means. In planning the arrangement of the studs, it should be borne in mind that MAFTEX boards are cut a scant 4 feet in width to allow ¼" spacing between sheets.

Application of MAFTEX

The MAFTEX should be moistened evenly, using about one quart of water to each side of every 4 by 8 feet of board. This wetting should be done 24 hours before the boards are to be used. Apply the boards with the long dimension parallel to the framing and be sure that there is ample nailing space along all edges. The board should never be forced to fit, but a space of ¼ inch should be left between all edges.

Nailing

Nail the boards to the intermediate studs or other framing first, using either box nails or lather's nails, 1¼ inches long, spaced 4 inches apart, driven straight; or finishing nails 1½ inches long, driven at a slight angle for all exposed nailing. All edges which are to be covered with battens should be

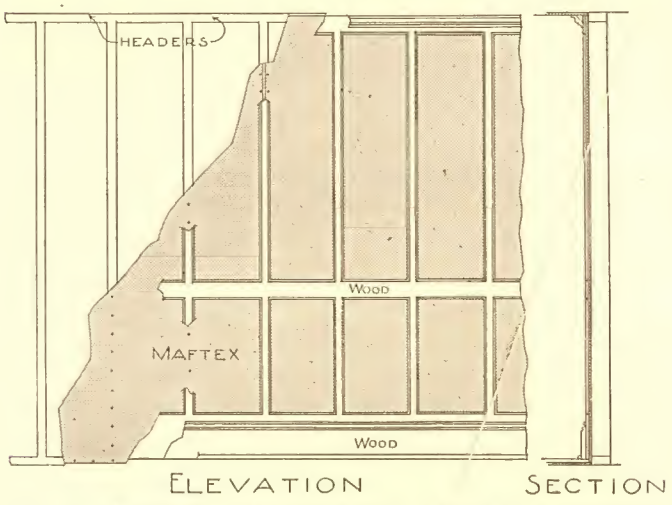


Fig. 6. MAFTEX and wood battens applied in a somewhat similar manner to Fig. 5, thus insuring full insulation, but with the addition of a wider horizontal batten at chair rail height. The ceiling would have similar battens at joints.

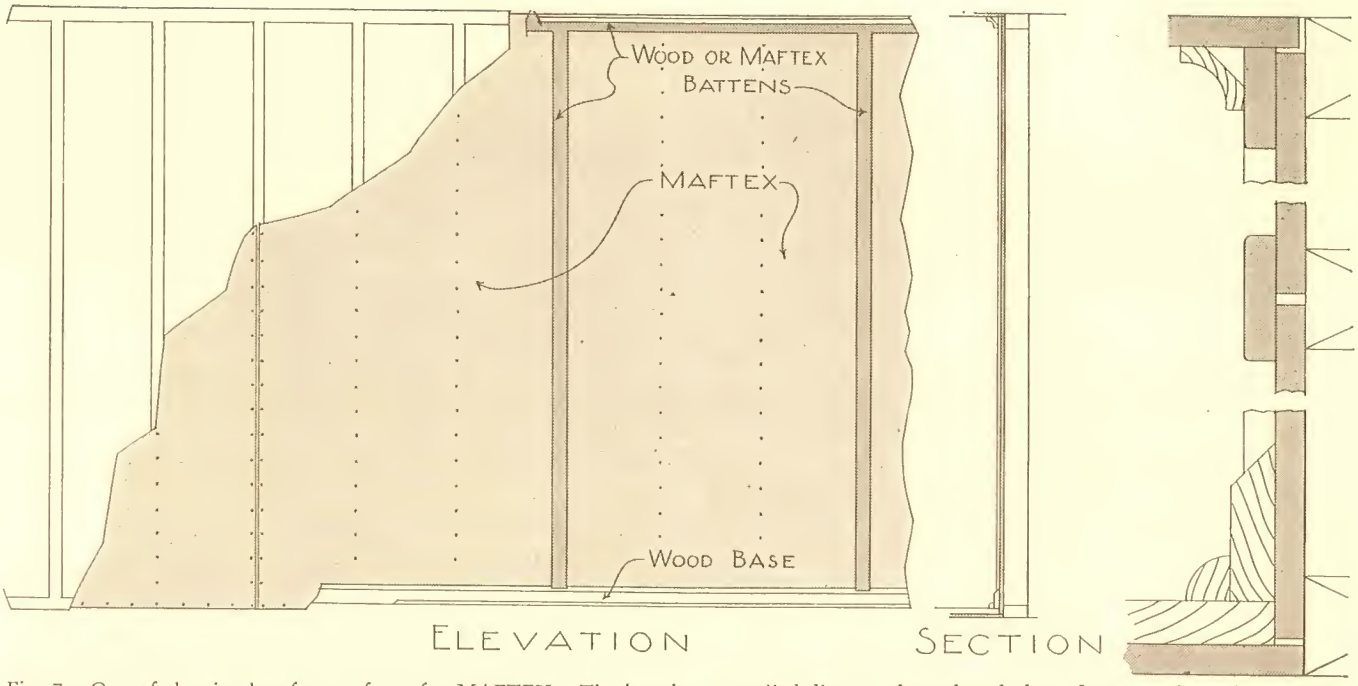


Fig. 7. One of the simplest forms of use for MAFTEX. The boards are applied direct to face of studs from floor to ceiling, thus insuring full insulation, with panels formed by using plain battens of wood or MAFTEX to cover vertical joints. A MAFTEX strip is placed at ceiling angle with wood crown molding and at floor a beveled wood base with wood quarter-round is used. The section and details at the side show the methods of construction and indicate MAFTEX on the ceiling for decorative effect and for sound-deadening from above and MAFTEX under the finished floor for sound-deadening from below. The intermediate nail heads may either be "set" and puttied for painting or staining or be concealed by "flaps" as described on this page.

nailed with the same box nails or lather's nails, although large-headed galvanized roofing nails 1½ inches in length may be used if desired. These should, in either case, be spaced about 3″ to 4″ apart and ⅜″ in from the edges.

Nailing Concealed by Flaps

Where it is desired to secure an unbroken plane of wall or ceiling, the heads of nails may be concealed by gouging up a thin flap of the surface at each nailing point, setting the nails below the flaps, and pasting down flaps over the nail heads with colorless glue, cement or other suitable adhesive.

Battens

The battens may be made any width desired, depending upon the type of paneling and other factors. Ordinarily these will be of wood, but strips of MAFTEX from 2″ to 3″ wide will be found very satisfactory if the edges are slightly rounded or beveled with fine sandpaper or with special tools that may be obtained for this purpose. The battens should be nailed through the MAFTEX into the studs, using 2¼″ finishing nails driven at an angle. If the battens are of wood, the nails should be set and the holes treated in the usual manner with putty before painting, or the concealed flap method, described above, may be employed.

Painting or Staining

AS PREVIOUSLY stated, MAFTEX is manufactured in a pleasing neutral tone, and for certain purposes and surroundings the natural color will furnish an effective background, only wood battens being painted or stained. Painting and staining of the surface is described below, for those who desire this type of finish.

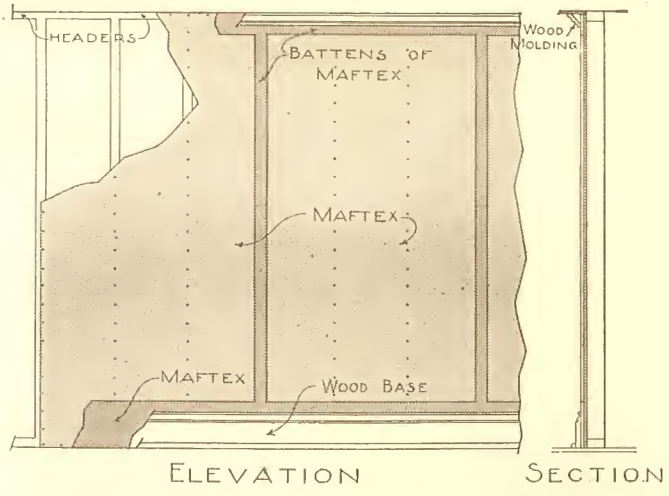


Fig. 8. A variation of Fig. 7 with MAFTEX used directly over studs and vertical joints covered with strips, or battens, of MAFTEX. The horizontal pieces of MAFTEX at top and bottom are supplemented with a wood molding at ceiling and a wood baseboard. The ceiling would have similar "battens" of MAFTEX over the joints.

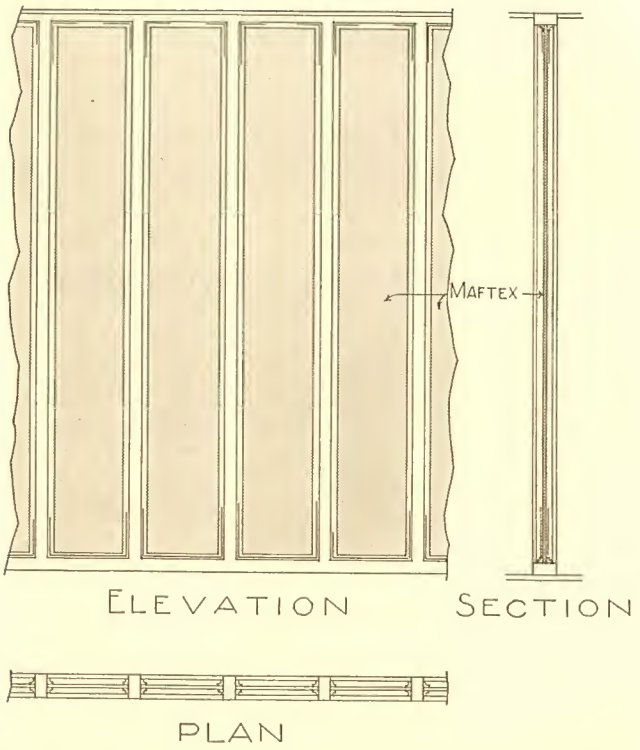


Fig. 9. A type of construction developed for summer cottages, clubs, etc., MAFTEX, cut to the width required, is placed midway between the studs and held in place with wood moldings fastened direct to the studs on each side of the MAFTEX. This means only one line of separation between rooms instead of the usual two thicknesses when plastered or boarded on both faces of studs, but gives an economical and effective result. The ceiling would consist of exposed joists with the MAFTEX under the flooring above showing, as illustrated in Fig. 5.

Painting

Ordinary lead and oil paints may be applied satisfactorily to MAFTEX without sizing or priming. Two coat work is advised for the most effective results.

Where battens are to be used with the MAFTEX surface painted, the first coat should be applied before battens are put in place, thus obviating all possibility of an unpainted line being exposed at the edge of the batten.

Plastic Paint

Directions are not given here for the application of plastic paints, as the mixes and methods will vary with each individual manufacturer. In general, plastic paints consist of a dry powder which is mixed with water to a specified consistency and applied to the MAFTEX with a wide brush. These paints may be given almost any type of textural finish in accordance with the directions of the manufacturer.

Usually these paints are white and are painted or stenciled after application to the wall. When it is desired to have a uniform color, pigments may be mixed with the paint before application.

Staining

Staining with the ordinary commercial stains will prove perfectly satisfactory on MAFTEX, providing the manufacturer's directions are followed. Any color or combination of colors which will prove harmonious with the decorative scheme may be used. Stencil effects, employing the natural tone of the MAFTEX as a background, give all the pleasing results of grass paper and most unusual and attractive treatments may be developed.

Kalsomining

When using kalsomine over MAFTEX the surface should have been sized or ordinary glue size must be added to the mixture. Follow the directions of the manufacturer in applying the kalsomine, which may be stenciled in most pleasing effects if desired.

MAFTEX "Thermal-Insulating" Board is fabricated in 4 foot widths and 8, 9, 10 and 12 foot lengths, 7/16 inch thickness.

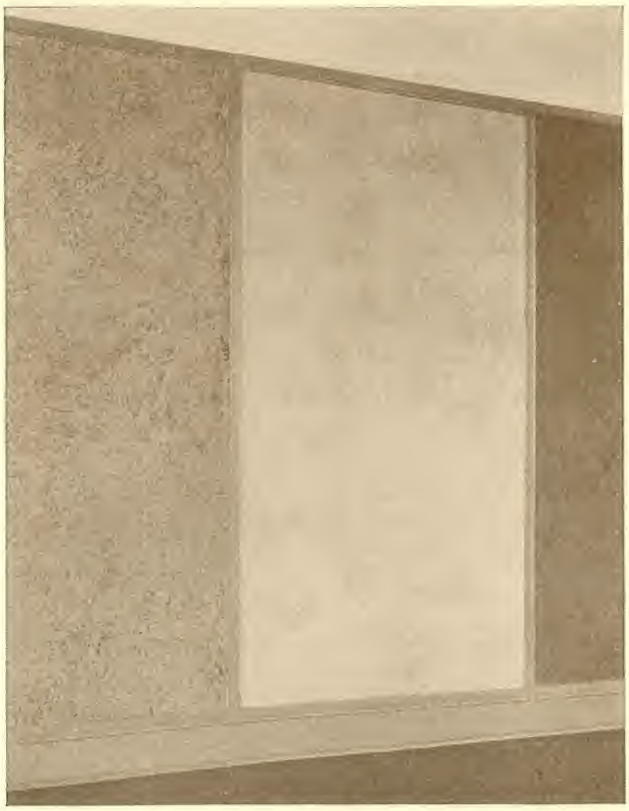


Fig. 10. MAFTEX, in a display room, used for panels similar in construction and effect to Fig. 3. The surfaces of the MAFTEX in this case have, however, been covered with a plastic finish on the left side, with a textural gypsum finish on the center panel and the MAFTEX has been left exposed on the right side.

MAFTEX used as a sound deadener (and plaster base) on dividing partition walls, Parkway Arms Apt., Larchmont, N. Y. Radding Construction Co., Larchmont, N. Y., Builders.

CHAPTER V

MAFTEX

For Sound-Deadening

AS present-day civilization rapidly progresses, new demands are constantly being made for greater refinements in construction—one of the most recent being sound-proof construction.

Popular interest in the subject is so new that many have not had the opportunity to familiarize themselves with the principles involved. It is possible, however, with a knowledge of the basic principles of acoustics and with the aid of the structural materials now available, to secure excellent results in sound-proofing.

Characteristics of Sound

When a sound wave reaches the ear drum, the impulses produce alternate compressions and distensions of the membrane corresponding in frequency to the actuating air impulses. The result is the sensation of sound.

Several of the more important characteristics of sound should be noted. In the first place, it should be clearly understood that sound is a form of energy just as truly as heat and electricity. As a result, sound waves are capable of imparting motion to heavy objects. Actually, the energy of a sound wave is very minute, and the amount of motion it may cause is therefore slight.

All sound is not alike, as we know from the range of the musical scale. The "pitch" of a sound or musical note depends upon the frequency with which the vibrations or waves occur. The human ear is sensitive to vibrations occurring with a frequency of between ten per second and thirty thousand per second. Air impulses occurring less or more frequently are not heard.

The speed with which sound moves depends chiefly upon the medium through which it travels. In air the speed is approximately 1/5 of a mile per second. Its speed through water is about four times as great, and through wood twelve times as great.

MAFTEX being applied for sound deadening (also for interior finish and insulation) in Scott Hotel, Oquaga Lake, N. Y. Conrad and Cummings, Architects, Binghamton, N. Y.

Unlike light, sound does not of necessity travel in straight lines. It will go "around corners" and travel in circuitous routes with little loss in energy.

As sound progresses from its source its intensity or loudness decreases. For example, if we double the distance from the source the intensity is somewhat less than one quarter as great.

Thus far we have considered only the transmission of sound through air. Were other materials incapable of transmitting sound, the problem of sound-proofing would be a simple one. It would only be necessary to surround the room or structure with an air-tight medium, taking care to make the enclosure tight. Experience has shown, however, that when sound waves strike such a barrier their progress is retarded, but not completely stopped. A consideration of the mechanism of sound transfer under such conditions is important if we are to understand sound-proofing of building partitions.

Effect of Sound Waves

When sound waves strike the surface of an air-tight partition several things happen. In the first place, a large portion of the incident sound is reflected back in the direction of the source in exactly the same way that a mirror reflects light. Another portion of the sound energy is conducted through the dense material in the form of a wave just as was described in the case of air. A final component transfers its energy to the structure causing it to vibrate like the diaphragm of a loud speaker or the ear drum. The vibration of the structure is in turn communicated to the air on the opposite side, reproducing sound waves which continue on their way.

The effect last described is known as diaphragmatic action, and is of a great practical importance in sound-proof building construction. The effect is greatest in highly elastic materials such as sheet steel, glass and hard plaster, particularly if they be rigidly supported, but becomes negligible in the case of non-elastic materials such as felted fibrous sheets.

Ideal Sound-Proofing Material

Having in mind the basic principles of sound generation and transmission as we have outlined them, the characteristics of an ideal sound - deadening structural material may now be considered.

MAFTEX used for sound deadening between partition walls (also for roof insulating) in Chateau Lafayette, Greenwich, Conn. E. Gisondi, Inc., Mt. Vernon, N. Y., Builders.

First—In order to prevent the direct passage of sound waves with air as the transmitting medium the material should be approximately "air-tight." Direct air channels through a material will permit the transfer of sound even if the courses of the channels are circuitous in the extreme.

MAFTEX used as a sound deadener in bowling alleys of Moose Home, Bridgeton, N. J.

Second—The material should be reasonably thick so that sound waves set up in the material itself will "decay" or decrease in intensity in passage from one side to the other.

In MAFTEX we find a particularly satisfactory combination of the desirable characteristics of a sound-deadening material as enumerated above. The closely felted structure of the sheet stops effectively the direct transfer of sound impulses by air alone.

MAFTEX used for sound deadening (and for plaster base) in Lindy Arms, Mt. Vernon, N. Y.
L. M. Kaufman, New York, Architect

It is true that the material contains innumerable air cells, but, to pass from one to the other the sound energy must be conducted through separating walls which are poor conductors. Every time the sound impulse is required to pass from one air cell to the next there is a considerable energy loss, and the rate of "decay" or the "absorption" of the sound energy is therefore enormous.

The elastic characteristics of the sheet are such that diaphragmatic action is reduced to a minimum. It should be understood, however, that this diaphragmatic effect depends largely upon the manner of supporting the material, and, for this reason, the specifications given in this chapter should be followed as closely as possible.

Application of Sound-Deadening Material

In order to construct a partition or floor which will stop sound transmission, we must, first of all, prevent the passage of air waves carrying the sound. Such a partition or floor must not only prevent the passage of sound through the partition, but should absorb as much as possible and not reflect it back into the room. Furthermore, the partition must be prevented from vibrating to any great extent.

Experiments have shown that there are several ways of constructing a partition which will stop the passage of sound. Building thick concrete partition walls and floors is one, but this is clearly beyond reason because of the weight, cost and the amount of space such walls would occupy. We must therefore turn to other materials and methods.

Characteristics Required

Consideration of thick concrete construction has, however, made apparent the fact that to be *prac-*

ticable a sound-proof partition must have certain characteristics. Among these are:

(1) A high degree of resistance to sound waves.
(2) Lightness of weight.
(3) Reasonable thickness.
(4) Ease of alteration.
(5) Reasonable cost.
(6) Vermin proofness.

When MAFTEX is used in partitions and floors as described on the following pages, the construction will possess all the characteristics outlined above as essential to a sound-deadened structure.

MAFTEX Fulfills Requirements

Why MAFTEX is particularly suitable for this purpose is clear if the qualities of the board are studied. MAFTEX is a rigid cellular mass having high internal sound absorbing quality. It does not attract vermin. It will not rot, is economical, serviceable and labor saving. When wisely installed it may be depended upon to produce a high degree of resistance to sound transmission. Authorities agree after most thorough analysis and study that cellular, pressed, fibrous boards of the type of MAFTEX possess the highest qualities for sound-proofing and sound-deadening.

To provide the most satisfactory results, attention should be given also to any other parts of the partition or floor which might allow air to leak through. These may become important sources of sound transmission. They will include doors, electric conduits, pipes, ventilator ducts and similar equipment. If absolute sound-proof results are desired, the doors should be of special design or should have a heavy solid core. Flush doors with bucks and casings should be calked to prevent air leakage. The doors should also bear against cushioned rabbet strips and the threshhold openings should be closed off with automatic strips.

The following pages offer suggestions for sound-deadening construction.

MAFTEX used as sound-deadener and plaster base in State Normal School, Glassboro, N. J.

Methods of Sound Deadening

Although there will probably occur a few problems of sound-proofing which should be solved by a trained engineer, there will be many occasions when some suggestions for easy and inexpensive methods of sound-deadening will be welcomed.

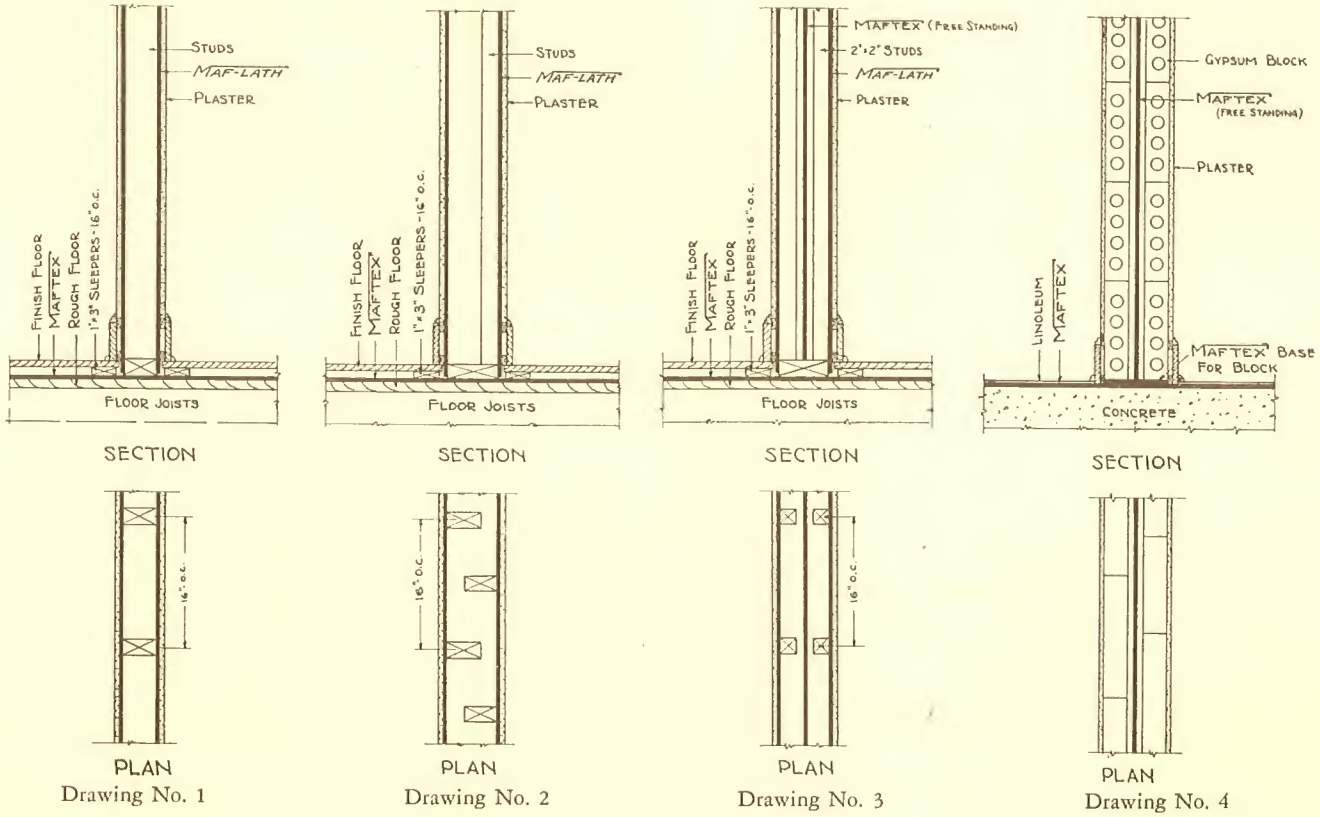
Sound Deadening of Partition Construction

Drawing Number One

This is the most simple of the various forms of construction shown. It will be noted from the drawing that a layer of MAFTEX is laid on top of the rough or sub-floor and on this are placed 1″ x 3″ sleepers spaced 16″ on centers on which the finished floor is laid. In building the partition a 2″ x 4″ sill is laid on top of the MAFTEX and the studs are set on this cushioned sill. The studs should be 16″ on centers and the MAF-LATH installed in the usual manner for a plaster base. This method of sound-deadening, although not as efficient as the others shown, is easy to install and provides a sound-deadener for the floor as well as the partition. The layer of MAFTEX extending under the sill, which in turn supports the studs, has a value in that it tends to reduce the vibration and the diaphragmatic action which is set up in the partition by the action of sound striking against it.

Drawing Number Two

Next in order of efficiency of sound-deadening is the "Staggered Stud" partition shown in the second drawing. In various forms this partition has been in use for many years. It has two disadvantages—namely, that it is more expensive to construct and that it occupies more space than the usual partition. In the drawing it will be seen that the studs are set on a sill which in turn rests on a layer of MAFTEX placed on top of the rough floor. The studs are placed 16″ on centers and there is no through connection between the two sides of the wall. The studs shown are the ordinary 2″ x 4″ size, but in some cases it may be possible to reduce this to 2″ x 3″, depending upon the height of the partition and other factors. The plaster is applied directly to the surface of the MAF-LATH as described in another chapter.



Drawing No. 1 Drawing No. 2 Drawing No. 3 Drawing No. 4

Drawing Number Three

The most efficient of the three partitions shown for use in frame construction is that illustrated in the third drawing. Here the form of construction is practically the same as that previously shown as far as the sill is concerned. Above this is placed a double row of 2″ x 2″ studs, 16″ on centers. These have a 2″ space between them and into this space are placed sheets of MAFTEX. These sheets are free-standing and loose, not being nailed to any part of the construction. To the outside of the studs MAF-LATH is applied in the usual manner for plaster base. Although this partition occupies more space than the one shown in Drawing Number One, it is comparatively inexpensive and light in weight.

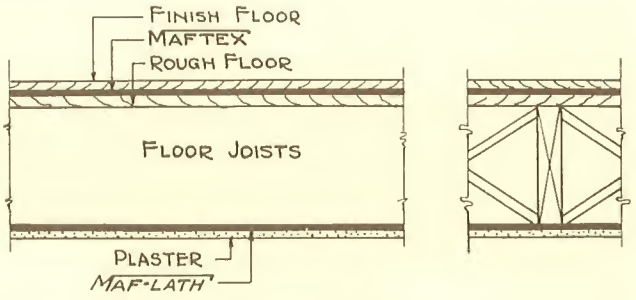
Drawing Number Four

The fourth drawing shows a type of construction particularly suited to apartment houses, apartment hotels, hotels, office buildings and similar structures. It illustrates an efficient fire-resistive partition constructed of gypsum blocks. The same principles could well be applied to a partition of hollow tile and in some cases to a steel stud and metal lath partition. Attention is called to the fact that on top of the concrete floor a layer of MAFTEX is laid as a base for the linoleum floor covering. On top of this layer, under the first course of block a separate layer of MAFTEX is laid to act as a cushion. There are really two separate and entirely unconnected partitions with a space of 2″ between them. In this space are placed free standing sheets of MAFTEX which perform the same function in reducing the sound transmission as in the partition shown in Drawing Number Three. Although 3″ gypsum block is shown in the drawing the thickness will, of course, depend upon the height and length of the partition as well as other factors.

Sound Deadening of Floor Construction

Drawing Number Five

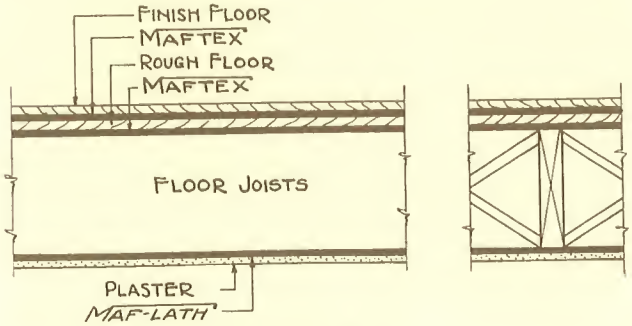
In the last analysis, the subject of sound-deadening of floors becomes a matter of overcoming impact on the floor. In this drawing the MAFTEX is shown laid directly on top of the rough floor, with only enough nailing to hold the board in place until the finished floor can be installed. The finished floor is nailed through the MAFTEX into the sub-floor and nails long enough to provide a good nailing should be used.



Drawing No. 5

Drawing Number Six

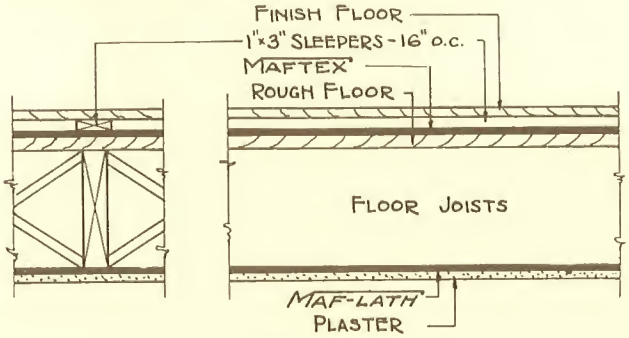
The second method of sound-deadening a wood joist floor is basically the same as the preceding one. It will be noted that the only difference is a second layer of MAFTEX which is laid directly on top of the joists underneath the rough floor. This increases the cushion action and further eliminates the transmission of impact sounds.



Drawing No. 6

Drawing Number Seven

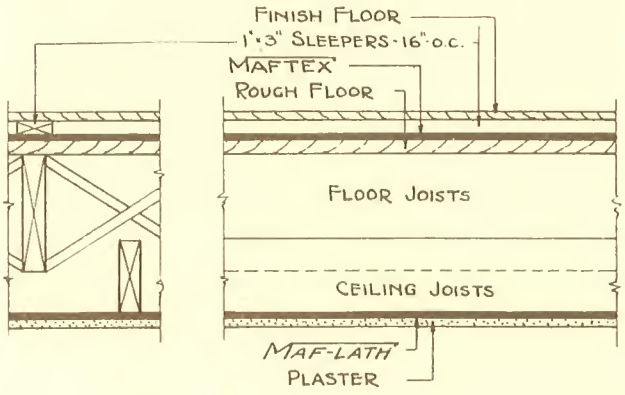
In this drawing there is shown a more elaborate method of deadening. The rough floor is laid as usual and on top of this is placed a layer of MAFTEX. On top of the MAFTEX and nailed through to the joists are placed 1″ x 3″ sleepers. These strips run parallel to and on top of the joists and are spaced the same, namely 16″ on centers. The finished floor is then laid on top of these sleepers and securely nailed to them.



Drawing No. 7

Drawing Number Eight

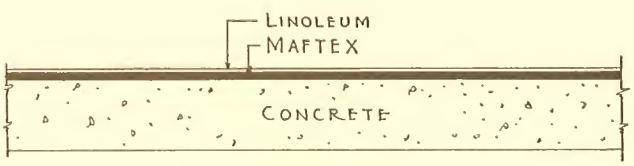
The method shown in this drawing is probably the most efficient of those here illustrated for sound-deadening a wood joist construction. It is known by various names, but the form remains the same in all. The ceiling is entirely separated from the floor, independent joists carrying the MAF-LATH which is used as a plaster base. The joists supporting the floor are set 16″ on centers, a rough floor is laid on the joists and MAFTEX on top of this. Sleepers 1″ x 3″ are placed on the MAFTEX as previously described and the finished floor placed on the sleepers. As there are no through connections between the floor and ceiling, little sound can pass from one side to the other.



Drawing No. 8

Drawing Number Nine

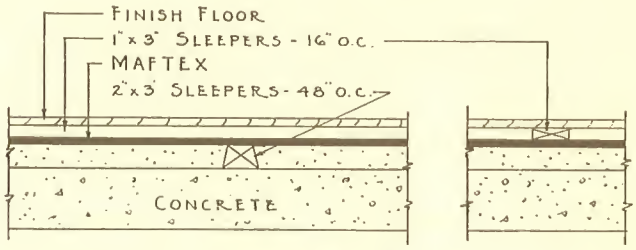
For sound-proofing of concrete floors which are to be covered with linoleum, the MAFTEX should be applied to the concrete in accordance with directions. Briefly, these directions call for the concrete to be covered with a waterproof primer, the MAFTEX to be firmly imbedded in a coating of asphaltic cement and the linoleum fastened to the MAFTEX with the usual linoleum cement. This will provide a cushion which will absorb much of the impact caused by foot steps, moving furniture, etc., which often cause annoyance. If carpets are to be laid on the MAFTEX, nailing strips will of course have been inserted and the MAFTEX need not be cemented to the concrete. Depending upon conditions, however, it may be desirable to spot mop the concrete just enough to hold the MAFTEX in place.



Drawing No. 9

Drawing Number Ten

If a wood floor is to be laid over the concrete the form of construction shown in the tenth drawing should be used. The usual 2″ x 3″ sleepers are placed in the concrete and the MAFTEX is nailed to these. These sleepers are placed 48″ on centers. Across these and on top of the MAFTEX are placed 1″ x 3″ nailing strips nailed through the MAFTEX into the sleepers which are imbedded in the concrete. These strips are spaced 16″ on centers. The finished floor is then nailed to these nailing strips.



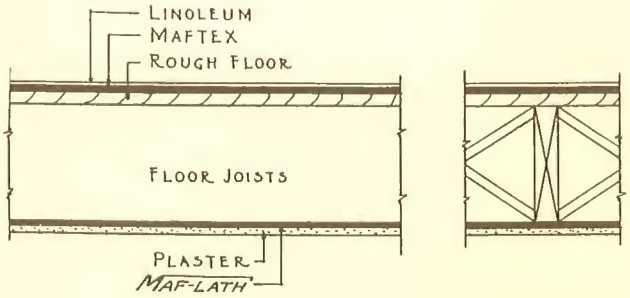
Drawing No. 10

Drawing Number Eleven

In some cases it is desirable to lay linoleum over a wood floor and at the same time reduce the sound of impact. This condition is shown in the next drawing. The wood floor should be of matched and dressed, tongued and grooved stock and the ends of the flooring should be so cut that all joints occur over the joists.

On top of the wood floor lay MAFTEX board, nailing each board with 4-penny nails through the center and along all edges. The adjoining edges should not be forced into contact and the MAFTEX should be kept ½″ away from all walls.

Lay the linoleum in an approved brand of linoleum cement over the MAFTEX base in accordance with the directions of the manufacturer of the linoleum.



Drawing No. 11

Acoustical Correction

Thus far we have considered problems relating only to sound-deadening—that is, the transfer of sound from room to room.

There is another branch of acoustics which is of great practical importance in building construction. This relates to the control of sound within a single room, and has for its object the suppression of echoes and kindred reverberating disturbances. Many an expensive and otherwise well-designed structure has been thoroughly unsatisfactory for its intended use because of disturbing echo effects.

The reason for the echo is easily explained with our present knowledge of sound, and being understood is readily corrected. The explanation is to be found in the fact that ordinary plaster or stone surfaces reflect sound almost perfectly. In fact the Bureau of Standards is responsible for the statement that "smooth rigid surfaces reflect sound more completely than even the best mirrors reflect light."

With this point in mind, and remembering that sound takes an appreciable time to travel from one point to another, let us consider the predicament of one listening to an address in a large auditorium. The speaker's voice reaches him and then continues to the rear wall of the room, from whence it is reflected and, in a fraction of a second, again reaches the listener from the opposite direction. By this time, however, a new sound is being received directly from the speaker and the net result is chaotic.

Obviously the solution to the problem of Acoustical Correction is to provide walls which will not reflect sound. Heavy draperies, thick carpets and even members of an audience absorb large amounts of sound energy, thus preventing its reflection. In many cases, however, additional absorbing surface is required to produce proper acoustical characteristics in an auditorium.

It has been found that MAFTEX is particularly suitable for acoustical correction in such cases. Mr. M. C. Rosenblatt, M. E., Consulting Acoustical Engineer of Philadelphia, has made an investigation of the sound-absorption characteristics of MAFTEX for MacAndrews & Forbes Company. Mr. Rosenblatt has found by careful scientific measurements that the Sound-Absorbing Coefficient of MAFTEX is 20.16%, which indicates that the product ranks very high among sound-absorbing materials and is therefore suitable for this type of construction.

MAFTEX PLASTER BASE used in this fine residence, Larchmont, N. Y.

CHAPTER VI

MAF-LATH

As Insulating Plaster Base

WALLS, partitions and ceilings of today must be more than mere divisions of the interior of a building into spaces for occupancy or other purposes. Conservation of heat in winter and its exclusion in summer, the retarding of condensation, sound deadening that absorbs and smothers the transmission of room-to-room noise, are all factors to which modern architects, builders and owners are giving the most careful attention.

To meet these demands by the supplementary application of special materials, involves additional time and expenditures for labor and material which are rarely justified.

The solution of the problem of securing these desirable results without increased costs, lies in the utilization of a material which, while supplanting ordinary lathing, will afford a perfect plaster base, insulation and sound deadening at one and the same time.

This accomplishment has been made possible through the development of MAF-LATH—a perfect plaster base combined with insulation and sound deadening for modern construction.

MAF-LATH as a Lathing Material

While small units or open meshes may first come to mind, correctly speaking the term "Lath" is more properly applied to any material designed to act as a base for plaster. Such lathing material may be fastened directly to studs, joists or furring strips on masonry. In discussing the subject of plaster base or lath the report of the Bureau of Standards Plastering Conference published as Circular of the Bureau of Standards, No. 151; "Wall Plaster: Its Ingredients, Preparation and Properties," states as follows:

"Probably the most important function of lath is to hold the scratch coat of plaster in position until

it has had time to harden. It must next display sufficient rigidity to prevent the 'key', or mechanical bond, of the scratch coat from breaking when the brown coat is applied. Finally, it acts as a reinforcing material to distribute any strains which may come upon the hardened plaster, thus reducing the tendency to crack."

licorice root fibers. (See Figures and Descriptions on Page 10.) This myriad of tentacles becomes so imbedded in and around the gypsum ground coat that even 1,000 lbs. pull to the square foot cannot loosen its vice-like gripping of the plaster. These countless mechanical bonds of almost unbelievable tenacity and endurance cover every inch of MAF-

Installing MAF-LATH as plaster base in new home in Stonegate—a beautiful Chicago suburb.

Until recent years there have been in common use only three distinct kinds of lath—wooden, metallic, which may in turn be sub-divided into several classes, and gypsum plaster board. Now, however, there has been placed on the market and at the disposal of architects and builders a new material—insulating board—which fulfills the three requirements for a plaster base mentioned above. A notable material in this class is MAF-LATH, which is the same material as MAFTEX, produced in smaller units of size especially for lathing purposes.

MAF-LATH has unusual bonding strength with gypsum plaster. This guarantees ability to "hold the scratch coat in position until it has had time to harden." Furthermore, the rigidity of MAF-LATH provides an unusual "reinforcing material to distribute any strains which may come upon the hardened plaster, thus reducing the tendency to crack."

Cause of the Enduring Plaster Bond

Micrographic studies of MAF-LATH show its bonding surfaces bristling with millions of the tiny

LATHED wall and ceiling area, insuring the strength so essential in the prevention of distortion or "breaking away" of the scratch coat when the brown coat is applied.

The interlaced fibrous structure of MAF-LATH presents a bonding surface on a resiliently rigid material that, when properly nailed to studs, joists or furring strips, distributes any strains which may

MAF-LATH is conveniently packaged for ready shipment.

come upon the hardened plaster, thus reducing the tendency of cracking, and otherwise protecting the finishing coat or any costly surface treatment and decoration.

The Insulation Behind the Bond

Characteristics of the roots of licorice which give to MAF-LATH its high degree of insulating efficiency, as well as enduring structural strength, resiliency, sound deadening and vermin retardant qualities, have been referred to in previous chapters.

In another section of this Manual are given complete illustrated descriptions of the effectiveness of these materials as barriers to thermal conductivity, based upon findings authenticated by, and published in, the Guide of the American Society of Heating and Ventilating Engineers. (See page 7.)

Insulation is a most important consideration for any plaster base on the inside of outside walls or on ceilings under roofs. A blanket against the escape of heat in winter and the entrance of heat in summer is furnished by MAF-LATH—a well-worth-while result which is obtained without the added expense for insulation. The Guide of the American Society of Heating and Ventilating Engineers is also authority for the statement that heat transmission for a wall constructed of clapboards, paper, wood sheathing, studs, lath and plaster is 0.227 British thermal units per degree difference in temperature between the two sides, per hour, per square foot when the wind velocity on the exterior of the wall is fifteen miles per hour. The same authority states that when ½ inch of fiber insulation in board form is used in place of wood sheathing and wood lath, the Coefficient of Transmission is reduced to 0.157 B.t.u. under the same conditions. This means a reduction in heat loss of approximately 30 per cent. The Bureau of Standards in Letter Circular 227 on Thermal-Insulation states that ½ inch of supplementary insulation is equivalent to an over-all saving of from 20 to 30 per cent of fuel. With one inch insulation—the building not being weatherstripped —the saving is from 30 to 40 per cent of fuel.

Applying plaster over MAF-LATH in home at Stonegate, shown on opposite page.

MAF-LATH is of convenient size for easy handling.

Sound Deadening in a Plaster Base

The same characteristics which make for the remarkable thermal-insulating qualities of MAFTEX "Thermal-Insulating" Board and MAFTEX Roof Insulating Board, give MAF-LATH, as a plaster base, the properties of acting as a deadener of sound in room-to-room transmission of noises or voices.

Summary of Advantages

Summarized, the advantages of MAF-LATH as a plaster base are:

First, the combination in one material of effective insulation, structural rigidity, strength and endurance of bond with gypsum plaster, sound deadening and lessened liability of cracking.

MAF-LATH being installed as plaster base in Philadelphia suburban residence.

This subject is, however, fully covered in Chapter V which precedes.

Application Cost of MAF-LATH Compared with Ordinary Lath

Competent construction superintendents have thoroughly analyzed and compared the cost of labor required in applying wood lath with that of MAF-LATH and the cost of the finished plaster on each.

These investigations were made in the field on buildings under actual construction, with MAF-LATH and wood lath applied in each case in exact accordance with recognized practice and plastered accordingly.

The authenticated findings are that the cost of the completed gypsum plaster "job" on MAF-LATH are only slightly greater than on ordinary wood lath, and considerably less than on metal lath.

Second, the ease and rapidity with which these materials may be applied and the plastering finished.

Third, no increase in first cost and a continual saving in fuel costs in winter and increased comfort in summer.

MAF-LATH used throughout as plaster base in "Courier-Express" Model Home, Kenmore, N. Y.

MAF-LATH is Exactly Like MAFTEX

Except in Size

While MAFTEX will always find favor, and is interchangeable as a sheathing, plaster base and decorative paneling material, MAF-LATH affords an insulating plaster base of more convenient size for wall, ceiling and soffit application than the larger boards of MAFTEX, and does away with much of the laying-out, cutting and trimming in its application on areas of odd or irregular shape.

Except for the difference in size, MAF-LATH is exactly like MAFTEX, with all of its insulating, structural, sound deadening and other excellent qualities.

MAF-LATH is dimensioned especially for rapid and effective application, the 48″ x 16″ size of each MAF-LATH covering an area equal to that of nine ordinary wood lath. Each dimension, as with MAF-TEX, is scant to allow for the ¼″ joint between each unit.

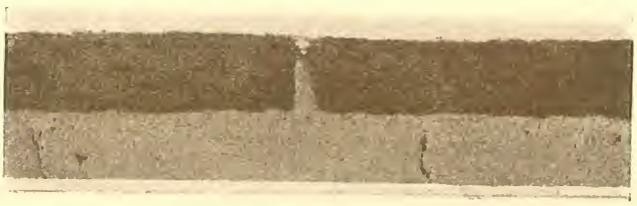
In its 48″ length, MAF-LATH adheres to the standard of studding spaced on 16″ centers; while the 16″ dimension permits a very close approximation of the accepted regulation of "breaking of joints" of wood lathing at 8 to 9 lath heights. The 16″ dimension possesses, moreover, the very decided further advantage that it permits the MAF-LATH to be laid, whenever desired, with its length parallel to the studs or joists, the 16″ width spacing from stud to stud or from joist to joist.

MAF-LATH like MAFTEX is 7/16″ thick, right out to the edges which means that it comes to the job solid, square and true, undamaged during shipment and remaining so during handling and application. The ground or scratch coat of plaster penetrates the space at each joint forming a strengthening, stiffening, protecting rib against the edges of each board.

MAF-LATH comes wrapped, 15 to the bundle, the equivalent of 80 square feet of ordinary lathing.

Complete installation of MAF-LATH as plaster base in same Philadelphia suburban residence shown on opposite page.

Applying plaster over MAF-LATH. Note ease of application, as no forcing is required for "keying" of ground coat.



MAF-LATH JOINT
Unretouched photograph of MAF-LATH Joint, illustrating the strengthening and stiffening "T" formed by the plaster.

Directions for the Application of MAF-LATH

Notes as to Framing

All framing members such as studs, furring strips and joists should be set in the usual manner and accurately spaced 16″ on centers. Where ceilings are to be plastered on the undersides of rafters or of collar-beams, the rafters and collar-beams should be spaced 16″ on centers. At the tops and bottoms of studded walls or partitions where girts, sills and plates do not occur, cut in 2″ x 4″ headers between the studding to serve as nailing blocks. Not only do these blocks serve for nailing the MAF-LATH and the metal lath in the angles but they also provide "fire-stopping" in the walls and partitions, an advantage of great importance in frame construction. When the MAF-LATH is to be applied to ceilings or rafters, similar headers should be placed at the ends of all joists or rafters. This method is shown in the drawings on the next pages. Insert cross strips between any furring at ends as shown by Figure 12.

Application of the MAF-LATH

Where ventilating conditions are very good, MAF-LATH may be applied without wetting. But for the best practice open the bundles of MAF-LATH to be used, twenty-four hours before the start of application and sprinkle both sides of each MAF-LATH, using about a half-pint of water to each side.

If applied in cold weather, do not allow boards to freeze after wetting.

MAF-LATH should be applied with the ripple side exposed and with the long dimension either across or parallel to the studs, joists, rafters or furring strips. The MAF-LATH should never be forced against each other to fit in place. Always allow ¼ inch joint between lath and ¼ inch clearance at ends and stagger the joints at ends. Where a tight joint is desirable with other materials—as around door frames, window frames and similar locations—the MAF-LATH should be brought into close contact.

For nailing MAF-LATH use large-headed lather's nails. These should have a 13 gauge shank 1-1/8 inch long with a 5/16 inch head. Space the nails 4 inches apart, with nail head driven slightly below the surface.

Reinforcing the Corners and Angles

NOTE: The directions which follow are not essential because of the use of MAF-LATH but are given as recommendations because it is commonly accepted practice in the case of all lathing applications to use an "elastic" material like expanded metal as a separate strip or overlap in internal angles to prevent any movement in the corners. This distributes the strain on the plaster at these places caused by the unequal shrinkage of floor structure itself and tends to obviate the straight wide-open crack in the angles so often seen where this simple expedient is not employed. As cracks are also almost certain to develop where wood studded walls abut masonry (when not furred) the precaution of spanning over this contact with metal lath or wire lath should also be followed as described.

In all vertical internal angles and in all angles between ceilings, soffits and walls lightly attach strips of painted expanded metal lath or galvanized wire lath cut 8 inches wide and bent into the shape of an "L" 4 inches on each side. The strips in all cases should be fastened along the edge but not in the corner. *If corner beads are not specified for all vertical corners, the same strips of metal lath or wire lath should be placed at all such corners.* Joints between frame and masonry walls *which are not furred* should be reinforced with the same kind of lath, lapping 4 inches on the masonry and 4 inches on the MAF-LATH.

Plastering

MAF-LATH must not be wet after application to studding.

In applying plaster to MAF-LATH it is of course essential that the plaster be well troweled and forced against the board and then brought to a reasonably true plane. Use quick-setting Gypsum Plaster. If it does not start to set in one and one-half hours, add accelerator or use a different brand of plaster.

NOTE: Never use lime plaster or gypsum neat plaster containing more than 10% of lime.

MAF-LATH may be plastered by either the two-coat or the three-coat method.

Two-Coat and Three-Coat Work

In two-coat work the scratch coat should be about ⅛″ in thickness, and the browning coat thoroughly

troweled to form a good bond with the scratch coat and giving a combined thickness of ⅜". In three-coat work the scratch coat should be about ⅛" in thickness. Before it is hardened it should be well scratched or scored. The best results are secured by making these scratches parallel and horizontal.

Applying "finish" coat in residence in which MAF-LATH is used as plaster base.

When the scratch coat is so hard that the pressure of the thumb will not break down the edge of the scratches, it is ready to receive the brown coat. The combined thickness of the scratch and brown coats should be ⅜".

In either two or three-coat work the brown coat should be rodded to produce a plane surface and smoothed with a darby. Any irregularities should be taken out with a float and before it is set firm and hard the surface should be broomed or roughened for the finish coat.

Any type of finish coat may be used but the brown coat should be thoroughly dry and hard before application. It should then be dampened and the finish coat spread as thin as possible without showing the under coat, into which it should be thoroughly worked. The whole area should be gone over as rapidly as possible and brought to a true and even plane throughout.

The circulation of air is important and the rapidity of evaporation of the water will depend largely upon the amount of air coming into contact with the plaster. The principal precaution in warm weather is to avoid too rapid or uneven drying. In cold weather protection of Gypsum Plaster from freezing is only necessary until it is set hard.

Notes on the Drawings for MAF-LATH Application

The drawings on the following pages have been prepared especially to illustrate the points mentioned in the "Directions" on the preceding page.

In Figure Ten the application of MAF-LATH to a stud wall is clearly shown. In this drawing it will be noted that a header is placed between the

studs with the bottom of the header at a level with the top of the rough floor. The MAF-LATH should not rest on the rough floor or on the MAFTEX Roof Insulating Board which is placed thereon as a sound deadener.

The directions specify the sizes of the nails to be used as well as the spacing.

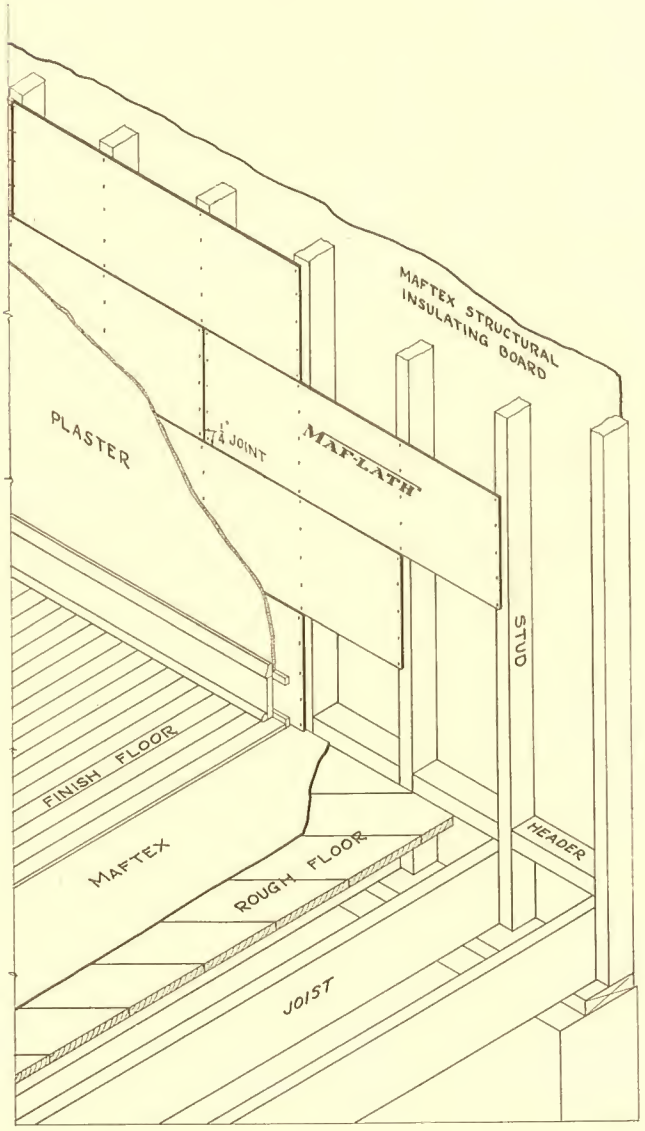


Fig. 10. MAF-LATH applied as plaster base, and MAFTEX applied as sheathing and sound deadening in frame construction.

This drawing also shows MAFTEX Structural Insulating Board applied to the outside of the studs as sheathing. The directions for application of MAFTEX for this purpose are given fully in Chapter III of this Manual. The MAFTEX ROOF INSULATING BOARD used as sound deadener between the rough and finished floor, as shown in Figure Ten, also serves another purpose as well, for it provides insulation against drafts which may come through the floor and which are especially annoying and dangerous if the floor happens to be over an open porch or the unheated portion of a cellar or basement.

Figure Eleven illustrates the method of applying MAF-LATH to a wood framed building at the ceiling joists. In this case the girt, which is let into the studs, forms the nailing base for the top edge of the MAF-LATH and the metal lath in the ceiling angle. Other than this the directions previously given apply here. On the ceiling it will be seen that headers are let in between the joists to provide a nailing for the edge of the ceiling MAF-LATH and the metal lath.

This drawing also shows the installation of the metal lath at the angles of the side walls and the ceiling. Similar strips of lath should be run up and down in all internal angles and external angles unless corner beads be used.

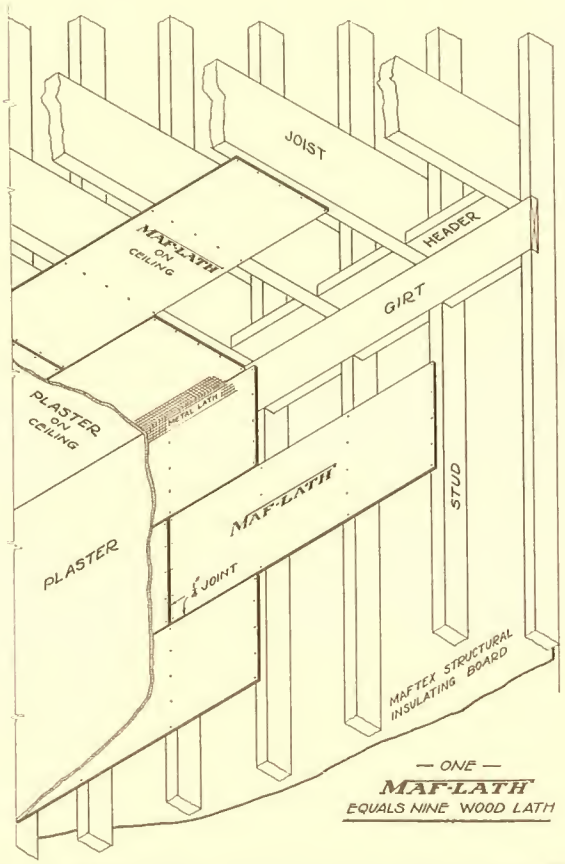


Fig. 11. MAF-LATH applied as a plaster base on ceiling and side wall construction.

Figure Twelve shows MAF-LATH applied to the inside of a brick wall on furring strips. All of the directions previously given are equally applicable here. The most important part of this detail is the header between the furring strips which provides a base for the nailing of the bottom of the lowest MAF-LATH and the sub-base providing at the same time a fire, draft and vermin stop. Similar strips should be inserted at the heads of the vertical strips beneath the ceiling joists to take care of the nailing of the edge of the MAF-LATH and the metal lath angle strip. Strips of similar metal lath should be placed at all joints between masonry and wood stud or joist construction. This applies particularly to partitions and wood framing around chimney breasts or fireplaces.

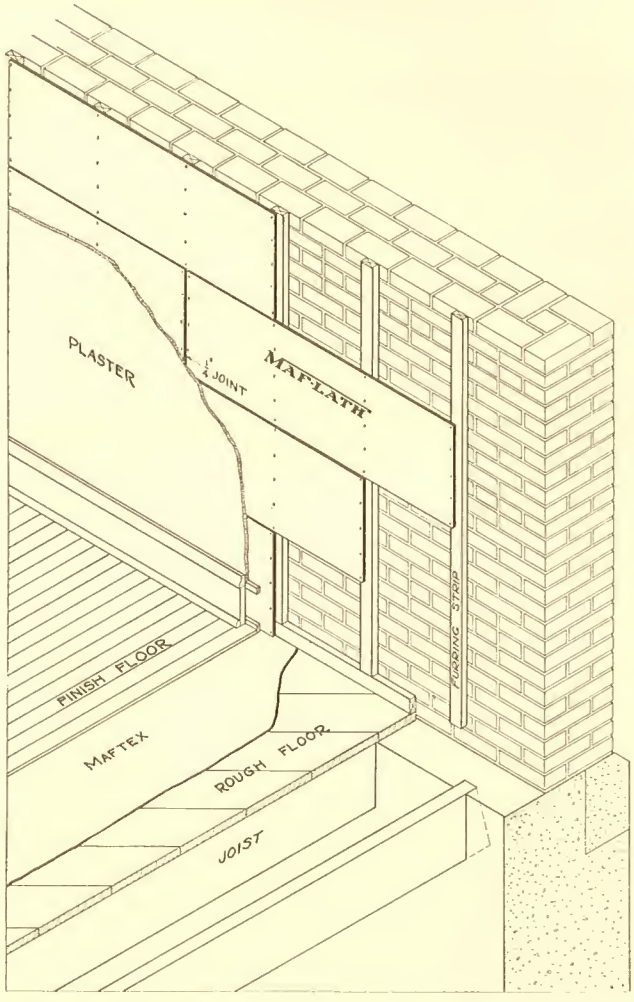


Fig. 12. MAF-LATH applied to furring strips on the interior of a masonry wall.

MAFTEX as a Plaster Base (Directions for Application)

Notes on Framing

All framing members and headers should be set in the manner described under the directions for the application of MAF-LATH. Wherever joints occur between sheets of MAFTEX on studded walls, cut in 2″ x 4″ headers between the studding to serve as nailing blocks for the ends of the MAFTEX. When the MAFTEX is to be applied to ceilings or rafters, similar headers should be placed at the ends of all MAFTEX sheets.

Application of the MAFTEX

It is important that the entire surface of each board be thoroughly wet 24 hours before application, using not less than one quart of water for each side of every 4 x 8 feet of board.

This dampening should be done in an even manner and care should be taken that the boards do not freeze in cold weather. Dampen only as many boards as can be used in one day and do not allow the boards to dry out completely before applying.

MAFTEX on studding should be applied with the ripple side exposed and with the long dimension parallel to the framing. It should have a solid bearing under all edges. The boards should never be forced against each other to fit in place. Always allow ¼ inch clearance between boards at both ends and sides. Where a tight joint is desirable with other materials—as around door frames, window frames and similar locations the MAFTEX should be brought into close contact.

For nailing MAFTEX use large-headed galvanized "roofing" nails 1½ inch in length. Beginning at the top or one end drive nails down the intermediate studs, joists, rafters or furring strips, spacing the nails 6 inches apart. It is important that the nailing always be done on the inside of the board before the edges. Follow by nailing the top edge, bottom edge and last of all the side edges. Along all edges the nails should be placed 4 inches apart and 3/8 inch from the edge. The nails should be driven until the head is slightly below the surface of the board.

ALTERNATE: The above provisions are especially applicable when the work is done by carpenters. If the MAFTEX is applied by lathers the sheets may be nailed with special lather's blued nails 1⅛″ long with $\frac{5}{16}$″ round heads and 13 gauge shanks, or with 1¼″ blued asbestos shingle nails with $\frac{13}{32}$″ round heads and 11½ gauge shanks, provided all such nails are spaced not more than 4″ apart throughout.

Reinforcing the Joints and Corners

Over *all* joints lightly attach a strip of 4″ wide painted expanded metal lath or galvanized wire lath. Before applying the lath be sure that all joints are ¼ inch wide. If not, cut open with knife, chisel or saw. In all vertical internal angles and in all angles between ceilings, soffits and walls lightly attach strips of similar lath cut 8″ wide and bent into the shape of an "L" 4″ on each side. The strips in all cases should be fastened along the edge but not in the corner. If corner beads are not specified for all vertical corners, similar strips of metal lath or wire lath should be placed at all such corners. Joints between frame and masonry walls which are not furred should be reinforced in the same manner.

Plastering

Apply quick-setting GYPSUM PLASTER directly to the MAFTEX following the directions given for plastering on MAF-LATH.

MAFTEX used as plaster base in "Income Home," Kenmore, N. Y.

MAFTEX used as plaster base in Duplex Apartment, Scranton, Pa. Schneider Bros., Scranton, Pa., builders.

MAF-LATH used as plaster base throughout home in Egg Harbor, N. J.

MAFTEX used as plaster base throughout residence in Rye, N. Y. H. S. Stevens Co., Inc., Rye, N. Y., builders.

General Notes on Plastering

TO secure the most satisfactory results when plastering on MAFTEX it is important that only gypsum plaster be used and for this reason the following data regarding such plasters are presented as of interest to the architect.

Gypusm base coat plasters are manufactured both neat (without sand) and sanded (with sand) and each kind is ordinarily marketed in paper bags (weighing 80 pounds) and in jute bags (weighing 100 pounds). Either of these will be furnished unfibered, hair fibered or wood fibered. The most common, and the one which should be used for base coat work on MAF-LATH and MAFTEX, is the hair fibered type.

The American Society for Testing Materials in 1921 adopted Standard Specifications for Gypsum Plasters. At the meeting of the Society in 1926, Committee C-11 on Gypsum recommended that certain changes be made in these specifications which would tend to raise the quality of the products. The quotations which follow contain these tentative revisions.

I. Gypsum Neat Plaster

6. Gypsum neat plaster is a plastering material in which not less than 60.5 percent of the cementitious material is calcined gypsum, calculated from the SO_3 content and mixed at the mill with other materials.

MAFTEX used as plaster base in residence near Merchantville, N. J.
Edwards & Green, Camden, N. J., architects.

7. Gypsum neat plaster shall contain not less than 60.5 percent, by weight, of calcined gypsum, calculated from the SO_3 content. The remainder may consist of materials to control the working quality, setting time and fibering.

8. Gypsum neat plaster when mixed with 3 parts, by weight, of testing sand shall set in not less than 8 hours nor more than 32 hours.

9. Gypsum neat plaster shall have a tensile strength of not less than 150 lbs. per square inch (10½ kg. per sq. cm.).

For certain localities where the sand is poor, for cold weather use to avoid trouble with frosty sand, or where it is not practicable to mix the sand on the job, gypsum plaster is supplied mixed with sand. Only clean sharp, siliceous sand, free from impurities, is used. As the sand is present in the correct proportions, no further sand should be added.

The Standard Specification for Gypsum Ready-Sanded Plasters of the American Society for Testing Materials as tentatively revised is as follows:

2. Gypsum ready-sanded plaster is a plastering material in which the predominating cementitious material is calcined gypsum, and which is mixed at the mill with all the constituent parts, including sand, in their proper proportion. It requires only the addition of water to make it ready for use.

II. Gypsum Ready-Sanded Plaster

3. Thee following shall govern the composition of gypsum ready-sanded plaster for the desired coats.

(a) *Scratch or First Coat.* Gypsum ready-sanded plaster used for scratch or first coat shall contain not more than two-thirds, by weight, of sand. The other one-third shall contain not less than 60.5 per cent, by weight, of calcined gypsum calculated from the SO_3 content. The remainder may consist of materials to control the working quality, setting time, and the fibering.

(b) *Browning or Second Coat.* Gypsum ready-sanded plaster used for browning or second coat shall contain not more than 75 per cent, by weight, of sand. The remainder shall contain not less than 60.5 per cent, by weight, of calcined gypsum, calculated from the SO_3 content. The other 39.5 per cent of this remainder may consist of materials to control the working quality, setting time, and the fibering.

4. The time of set of gypsum ready-sanded plaster shall be as follows:

(a) *Scratch or First Coat.* This plaster shall set in not less than 1½ nor more than 7 hours.

(b) *Browning or Second Coat.* This plaster shall set in not less than 2 nor more than 6 hours.

MAFTEX used as subsheathing and plaster base in Bellport, L. I., home.
Armstrong & Pierman, Bellport, L. I., contractors.

5. The tensile strength of gypsum ready-sanded plaster shall be as follows:

(a) *Scratch or First Coat.* This plaster shall have a tensile strength of not less than 75 lbs. per square inch (5¼ kg. per sq. cm.).

(b) *Browning or Second Coat.* This plaster shall have a tensile strength of not less than 50 lbs. per square inch (3½ kg. per sq. cm.).

Application

Regarding two-coat work: Circular No. 151 of the Bureau of Standards entitled "Wall Plaster, Its Ingredients, Preparation and Properties," states in part:

" 'Doubled-up,' 'laid-off,' or 'laid-on' work, as it is variously called in different localities, means the application of the scratch and brown coats together, or at least without permitting the usual time to elapse between them. The scratch coat is applied in the way specified above, but it is not permitted to harden, nor is its surface scratched. The application of the brown coat is started immediately after finishing the application of the scratch coat. This method is obviously cheaper than straight three-coat work, but certain precautions are essential to its successful use. The brown coat must be applied before the hardening of the scratch coat has progressed far enough to produce a glazed surface. The backing must be sufficiently rigid of itself that it will not yield under the pressure of the trowel, and will not sag under the weight of the combined coats. If it deflects to any appreciable extent, the keys which hold the scratch coat to it will probably be broken, and if it sags, it will be found extremely difficult to bring the brown coat out to a true plane surface. For these reasons, doubled-up work shall not be applied to metal lath. Its use on wood lath is not recommended, particularly if the plaster is to be seven-eighths inch thick. On masonry backings the use of doubled-up work is largely a question of application—if the plasterer succeeds in making the plaster stick and is able to form a true and plane surface the work will be satisfactory. This depends on the thickness of the plaster and the nature of the backing. It is difficult to apply a doubled-up coat of a thickness greater than five-eighths inch. The great suction exerted by gypsum tile makes the application

of doubled-up work easy; on clay tile it is almost impossible."

Proportions

It will be noted that no mention is made in the Directions of the proportions for the mix of plaster. This has been omitted purposely as the instructions of the manufacturer of the plaster should be followed.

Gypsum plaster is usually properly retarded by the manufacturer but under certain conditions it will be found that the use of impure water will cause the plaster to set faster or slower than it should for the best results. When the plaster sets too slowly it can be accelerated by use of the manufacturer's "Accelerator." When this material is not at hand, the plaster on the sides and bottom of the mixing box may be scraped off and mixed with the fresh plaster. Another remedy is the soaking of crushed pieces of set-up plaster for two hours in a barrel of water and using this water in the mix. If this does not accelerate the time enough dissolve from 4 to 6 pounds of alum or commercial zinc sulphate in a barrel of water. Depending upon the speed of set-up desired, mix from 2 to 12 quarts of this solution in the water required for the mixing of one bag of plaster.

C. H. Eggleton
Boston, Mass.
Architect.

MAFTEX used as plaster base and sound deadener in fine residence, Lexington, Mass.

Wilson & Tomlinson,
Boston, Mass.
Contractors.

Ordinarily proportions for the First or Scratch coat should be made the same as those for wood lath, namely; one part plaster, hair fibered, to not more than two parts, by weight, of dry sand. The Second or Browning coat should usually be one part plaster, unfibered, to not more than two parts, by weight, of dry sand. The second coat should be applied with strong pressure and straightened to a true, even plane and the surface broomed or otherwise roughened to receive the finishing coat. The second coat should be applied when the first coat is set firm and hard but before it is dry. The selection of the type of finishing coat will depend upon the effect desired but the finishing coat should not be applied until the base plaster is set firm and hard and *thoroughly dry.* The surface of the base coat should be sprinkled with water before the finish coat is applied.

Plasters may be retarded by using the manufacturer's "Retarder." If this cannot be obtained readily dissolve one pound of pulverized glue in one gallon of hot water and use about one pint of this solution in the water necessary for the mixing of one bag of plaster.

Valuable suggestions regarding the use of gypsum plaster may be secured from the Gypsum Industries, 844 Rush Street, Chicago, Illinois.

Steel deck roof under construction.

Two layers of MAFTEX being applied over steel deck.

Roofing felt being applied over MAFTEX.

Finished slag roof.

LACKEY & HETTEL, INC.
Architects
Camden, N. J.

CAMDEN COUNTY VOCATIONAL SCHOOL, CAMDEN, N. J.

GEO. BACHMANN
Contractor and Builder
Camden, N. J.

MAFTEX ROOF INSULATING BOARD used for entire roof insulation. Illustrations show successive stages of this typical installation.

CHAPTER VII

MAFTEX
Roof Insulating Board

on various types of flat roof decks under built-up roofing

NOTE

The "Directions" which follow are intended for Flat Roofs not exceeding a slope of 3 inches to the foot if asphalt is used and 2 inches to the foot if coal tar pitch is used. When the application is to be on slopes in excess of the above suitable provision for fastening the felts must be made and it is recommended that the suggestions and specifications of the manufacturers of built-up roofing materials be followed.

EVERY roof, whether it be sloping or flat, needs insulation. The greatest loss of heat in winter and the greatest in-leakage of heat in summer is through the roof of any structure—a point which may be readily appreciated by comparing the temperature in any attic or loft space in either summer or winter with the temperature in the rooms below.

The roofs of the majority of large buildings such as factories, schools, hotels, offices, apartment houses and public buildings are of what is known as "flat roof construction." These roofs usually have enough slope to shed water into the gutter but they are still called flat roofs.

Purposes of Roof Insulation

Insulation is principally used on flat roofs for either or both of two purposes; first, to conserve heat; second, to prevent condensation. It is also used to keep out heat in summer, although the value of insulation for this purpose is not as widely appreciated on flat roofs of other buildings as it is for residences.

Another and very important use of insulating board on flat roofs of the concrete type is for the prevention of the expansion and contraction which inevitably takes place and which often does considerable damage to the roof covering.

The flat roof deck may be constructed of a wide variety of materials. In factories and non-fireproof buildings of all types, probably the most common is the wood deck. Depending upon the span, weight of the roof covering and other factors, the thickness of the deck will vary from one inch to three inches. On top of this may be placed the usual standard roof covering or some type of metal roofing. For fire-resistive construction the deck may be of steel with gypsum slabs, concrete beams and tile slabs, solid reinforced concrete slabs, concrete and cinder fill or precast concrete or gypsum tile. The thickness of the types will also vary with other factors. In some structures a metal roof deck is used under the usual roof coverings, a type which is steadily increasing in popularity.

Heat Savings

Although insulation of one type or another may be applied to flat roofs for all of the reasons outlined above, the primary purpose is usually to retain heat inside the structure. Every insulating material has a definite factor of heat conductivity which is a measure of its insulating value, and is commonly expressed in British thermal units. In order to have a definite basis for evaluating this factor, and especially for the purpose of standardizing test methods, the conductivity is limited to a definite area—one square foot; a definite time—one hour; a definite difference in temperature—one degree; and a definite thickness—one inch.

Resistance Factor

For insulating materials a resistance factor is sometimes used instead of the conductivity factor. This resistance factor is the reciprocal of the conductivity as expressed above. In this connection it

should be remembered that the higher the resistance the better the material from an insulation standpoint, but that when conductivity is considered the lower the factor the better the insulation.

The coefficient of conductivity of 0.34 for MAFTEX may be used with safety in all computations of thermal insulation.

For purposes of comparison it is interesting to note that the conductivity of concrete is from 6 to 9 British thermal units per inch, per hour, per square foot, per degree Fahrenheit difference in temperature. In other words plain concrete allows from seventeen to twenty-five times as much heat to pass through it in the same time as does MAFTEX. See Chapter I for conductivity of various materials.

With these figures as a basis it is not only possible but thoroughly practical to figure the fuel savings which can be obtained by applying one or more layers of MAFTEX on top of the roof deck, whether this be built of wood, metal, concrete or other materials. Furthermore the amount of radiation which can be saved can also be readily computed. A table showing the coefficients of Heat Transmission for various types of roofs in terms of British thermal-units per hour, per square foot, per degree Fahrenheit difference in temperature is given below.

In using this table the architect or engineer should first determine upon the type of roof deck to be used on the structure and from the table ascertain the coefficient of transmission for the roof uninsulated and for the roof insulated with the number of layers under consideration. For example, a 4″ concrete roof without insulation has a coefficient of 0.60, whereas with two layers of MAFTEX applied, the coefficient is 0.23 or a difference of 0.37 (0.60—0.23=0.37). This means that the two layers of MAFTEX will keep in that amount of heat in terms of British thermal units. The architect should next determine from the weather reports of his locality the average outside temperature during the heating season. Assume this to be 34 degrees Fahrenheit. The temperature of air on the underside of the roof should then be determined according

Coefficients of Heat Transmission of Various Types of Roofs
with MAFTEX Roof Insulation

TYPE OF ROOF	Uninsulated		With One Layer Maftex		With Two Layers Maftex		With Three Layers Maftex		With Four Layers Maftex		With Five Layers Maftex	
	Coefficient of Heat Transmission	% Reduction in Heat Loss	Coefficient of Heat Transmission	% Reduction in Heat Loss	Coefficient of Heat Transmission	% Reduction in Heat loss	Coefficient of Heat Transmission	% Reduction in Heat Loss	Coefficient of Heat Transmission	% Reduction in Heat Loss	Coefficient of Heat Transmission	% Reduction in Heat Loss
Steel Deck	0.84	0	0.39	53.	0.26	69.	0.19	77.	0.15	82.	0.13	85.
2″ Stone Concrete	0.70	0	0.36	49.	0.24	66.	0.18	74.	0.15	79.	0.12	83.
3″ " "	0.65	0	0.35	47.	0.24	64.	0.18	72.	0.14	78.	0.12	81.
4″ " "	0.60	0	0.33	45.	0.23	62.	0.17	71.	0.14	76.	0.12	80.
6″ " "	0.52	0	0.31	41.	0.22	59.	0.17	68.	0.14	74.	0.12	78.
8″ " "	0.47	0	0.29	39.	0.21	56.	0.16	65.	0.13	71.	0.11	76.
2″ Cinder Concrete	0.49	0	0.30	40.	0.21	57.	0.16	67.	0.14	73.	0.11	77.
4″ " "	0.35	0	0.24	32.	0.18	49.	0.14	59.	0.12	65.	0.10	70.
6″ " "	0.27	0	0.20	27.	0.16	42.	0.13	52.	0.11	59.	0.10	65.
8″ " "	0.22	0	0.17	23.	0.14	37.	0.12	47.	0.10	54.	0.09	60.
2″ Stone Concrete with Cinder Fill	0.50	0	0.30	40.	0.21	57.	0.17	67.	0.14	73.	0.11	77.
3″ " " " " "	0.47	0	0.29	39.	0.21	56.	0.16	66.	0.13	72.	0.11	76.
4″ " " " " "	0.44	0	0.28	37.	0.20	55.	0.16	64.	0.13	71.	0.11	75.
6″ " " " " "	0.40	0	0.26	35.	0.19	52.	0.15	62.	0.13	68.	0.11	73.
8″ " " " " "	0.37	0	0.25	33.	0.18	50.	0.15	60.	0.12	66.	0.11	71.
2″ Concrete 2″ Hollow Tile	0.42	0	0.27	36.	0.20	53.	0.16	63.	0.13	69.	0.11	74.
2″ " 4″ " "	0.33	0	0.23	31.	0.17	47.	0.14	57.	0.12	64.	0.10	69.
2″ " 6″ " "	0.27	0	0.20	27.	0.16	42.	0.13	52.	0.11	59.	0.10	64.
2″ " 8″ " "	0.23	0	0.18	24.	0.14	38.	0.12	49.	0.10	55.	0.09	61.
4″ " 2″ " "	0.38	0	0.25	34.	0.19	51.	0.15	61.	0.13	67.	0.11	72.
4″ " 4″ " "	0.30	0	0.22	29.	0.17	45.	0.14	55.	0.12	62.	0.10	67.
4″ " 6″ " "	0.25	0	0.19	25.	0.15	41.	0.13	51.	0.11	58.	0.09	63.
4″ " 8″ " "	0.22	0	0.17	23.	0.14	37.	0.12	47.	0.10	54.	0.09	60.
1″ Wood Plank (⅞″)	0.48	0	0.29	39.	0.21	56.	0.16	66.	0.13	72.	0.11	76.
1½″ " " (1¼″)	0.40	0	0.26	35.	0.19	52.	0.15	62.	0.13	68.	0.11	73.
2″ " " (1¾″)	0.33	0	0.23	31.	0.17	48.	0.14	57.	0.12	64.	0.10	69.
2½″ " " (2¼″)	0.28	0	0.21	28.	0.16	44.	0.13	53.	0.11	60.	0.10	66.
3″ " " (2¾″)	0.25	0	0.19	25.	0.15	40.	0.12	50.	0.11	57.	0.09	62.

Coefficients expressed in B.t.u. per sq. ft. per Degree Fahrenheit per Hour. All coefficients include roofing. Coefficients will not apply for excessive wind velocities.

to the nature of the work or occupancy in the upper story. Assume it to be 75° Fahrenheit. The difference in temperature inside and outside is then 41° Fahrenheit (75°—34°=41°).

The length of the heating season may be determined for the locality but we can consider 210 days or 5040 hours in this problem. We are now ready to proceed. The saving is 0.37 British thermal units; this multiplied by the number of degrees difference in temperature (41° F.) and the result by the number of hours will give the number of British thermal units saved by two layers of insulation. Assume that the roof contains 15,000 square feet.

0.37 B.t.u. saving per degree difference in temperature per hour per square foot × 41 degrees difference in temperature = 15.17 B.t.u. per square foot per hour.

15.17 B.t.u. per square foot per hour × 5040 hours = 76,457 B.t.u. per square foot during heating season.

76,457 B.t.u. per square foot during heating season × 15,000 square feet = 1,146,852,000 B.t.u. total.

The ordinary coal may be considered as having 12,000 B.t.u. per pound, about 50% of which is useful, or 6,000 B.t.u.

Dividing—1,146,852,000 B.t.u. from above ÷ 6,000 B.t.u. per lb. = 191,142 lbs. or in Tons 191,142 lbs. ÷ 2,000 lbs. = 95.6 Tons.

Coal saving per year for a roof area of 15,000 sq. ft.

From the foregoing it will be seen that it is a simple matter to figure the savings in the amount of fuel. The dollar value can then readily be measured at the prevailing local price for the grade of coal to be burned.

Condensation Eliminated

When warm moist air comes in contact with a cool surface, condensation results. Considered in connection with roofs and side walls of manufacturing plants and other structures, this problem of condensation may become very serious.

Warm air will hold more moisture than cold air. The inside surfaces of a building (i.e., roofs and side walls) are continually cooled in winter by the cold air in contact with the outside of the structure. Thus there exists an ideal situation for the formation of condensation when the warm air, usually quite moist, comes against the cooled inside surface of roof or wall. "Sweat" is formed and sometimes is so serious as to drip on men, machinery or products below.

The problem, then, is one of keeping the inside surface of the building at as nearly the temperature of the inside air as possible. The logical answer is to insulate the walls and the roof to prevent the loss of heat and the consequent cooling of the interior surface.

The amount of insulation required to prevent condensation involves questions of temperatures, roof construction, ventilation, humidities and other factors. When the problem becomes complex, a competent heating and ventilating engineer should be consulted.

For ordinary conditions, however, it is perfectly feasible to determine the number of layers of MAFTEX required to prevent condensation and with this thought in mind, the chart on Page 54 has been prepared.

Other Purposes of Roof Insulation

In addition to the conservation of heat and prevention of condensation, roof insulation is of great value in keeping out the heat of the sun in summer. One great noticeable fault with one story factories, especially, and with the top floor of other structures has always been the "close feeling" and the heating up caused by the direct rays of the summer sun beating upon the unprotected roof.

Naturally the same material which keeps heat inside the building in winter will keep heat outside the building in summer and by the addition of insulation the top story can be made comfortable in the hottest weather. The insulation prevents the heat of the sun from reaching the still air close to the roof and raising its temperature to an unbearable degree. The transmission may be reduced as much as 30% with one layer of MAFTEX on a 2-inch wood roof deck.

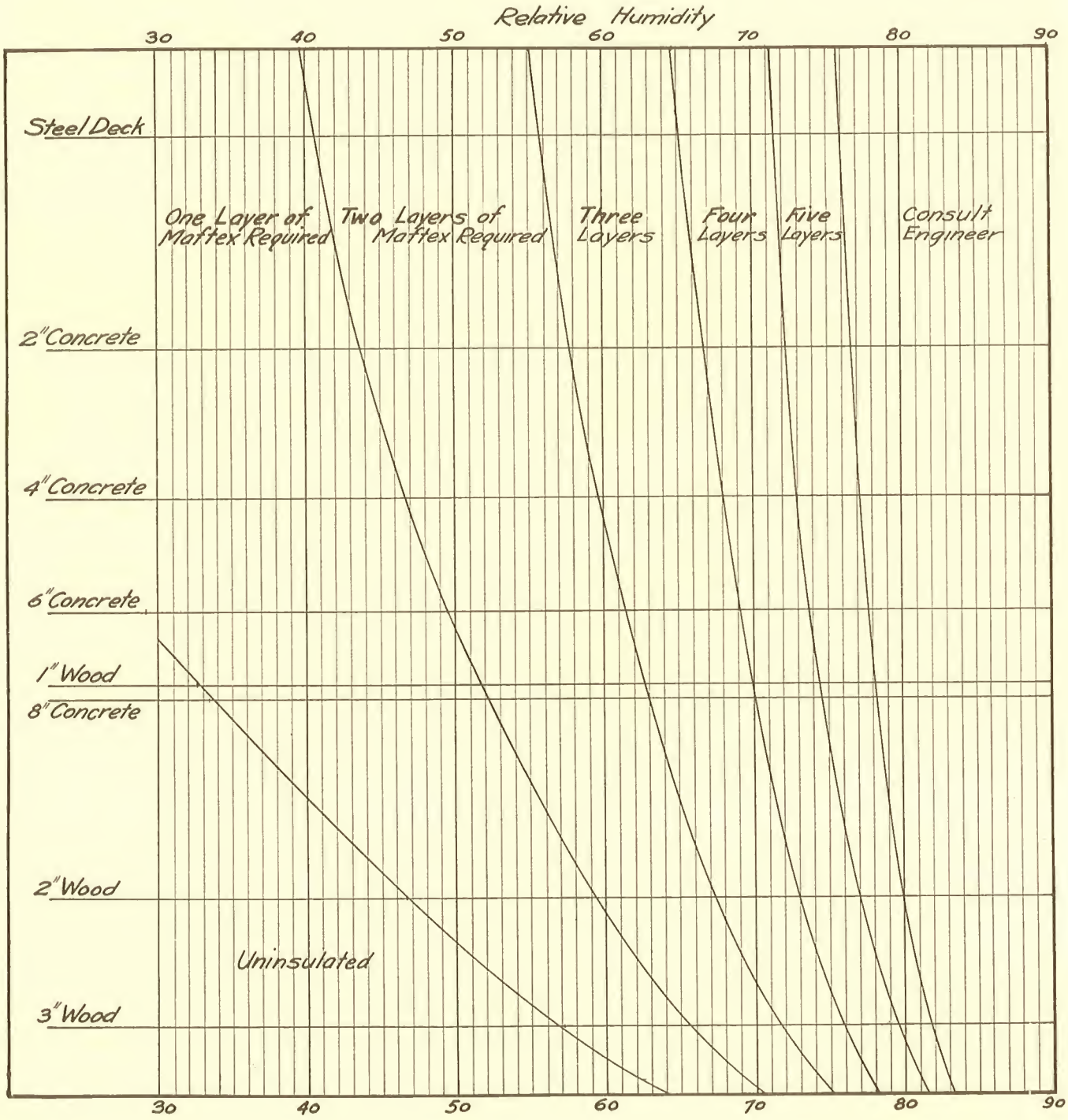
Expansion and Contraction Reduced

Another valuable feature of insulation on a concrete deck is the reduction in expansion and contraction. The expansion of a concrete roof deck may be materially reduced, sometimes as much as 50 to 60 percent by adding two layers of MAFTEX to the concrete beneath the roof covering.

Directions and drawings for the application of MAFTEX on various types of roof decks are printed on the succeeding pages.

Condensation Chart

The chart below has been prepared to assist the architect and engineer in determining the number of layers of MAFTEX required to prevent condensation under ordinary conditions. The data used as the basis of this chart are a constant inside temperature at the roof line of 100° F. and an outside temperature of 0° F. When these conditions obtain in the proposed structure this chart may be used. If other inside temperatures are to be considered, the specially prepared chart on Page 63 should be consulted.



Directions and Specifications for Application

Concrete Roof Decks

Concrete Deck

The concrete roof deck should be well seasoned and absolutely dry before proceeding with any roofing work. The surface should present an even plane and should be thoroughly cleaned of loose materials and dirt. The deck should be examined by the roofing contractor and be in such condition as to be acceptable to him as well as the architect.

NOTE: *Under certain conditions of smoothness or absorption and with some types of concrete it will be desirable to use a waterproof primer to facilitate a proper bond.*

NOTE: *Under the specification for Concrete Work, reference should be made to the fact that the contractor should leave the roof deck properly graded to drains, scuppers or other outlets and of even plane throughout, free from depressions or bumps.*

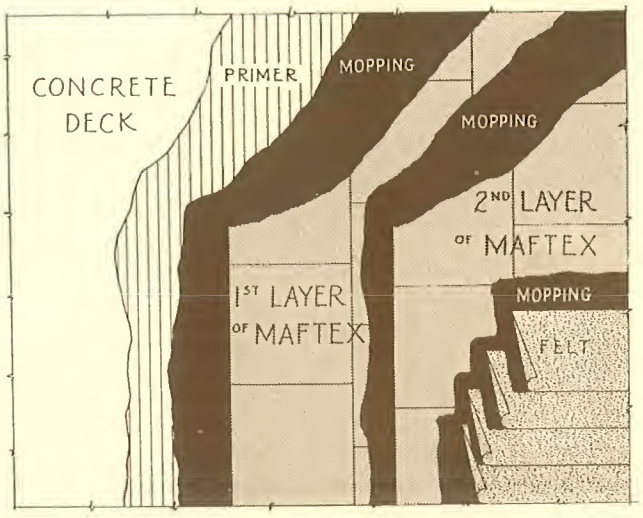
Application of MAFTEX

The slab should be well mopped with hot asphalt or pitch and the MAFTEX Roof Insulating Board imbedded thoroughly by pressing the entire surface to the deck. A space of ⅛ inch should be kept between all edges of the Boards and the edges be well filled with asphalt or pitch.

If more than one layer of MAFTEX is to be used mop uniformly and completely the top surface of each layer. The joints should be staggered and the boards imbedded in the hot asphalt.

MAFTEX should be neatly cut to fit around projections such as vent pipes, flag poles, etc., and at penthouses, walls, skylights, etc.

Do not lay more MAFTEX than can be covered with roof covering in one day. Protect exposed edges of MAFTEX when work is stopped, by a sheet of roofing paper weighted to hold it in place. This



MAFTEX on Concrete Roof Deck

is necessary for, although the MAFTEX is not injured by water, no bituminous material will bond satisfactorily on a wet surface or a surface moistened by night air.

If the MAFTEX is to be installed on sloping roofs where there may be possibility of slipping, the sheets should be anchored.

Any "standard" built-up roofing may be applied to the MAFTEX following the directions of the manufacturer.

Architects' Short Form Specification

(For Inclusion in Roofing Contractors' Work)

The contractor for roofing shall furnish and apply . . . layers of MAFTEX Roof Insulating Board to the concrete deck before installing roofing. MAFTEX shall be applied in accordance with the directions of the maker published on Page 55 of the MAFTEX Manual, dated 1928, and on file in the office of the architect.

See also "Note" under "Concrete Deck."

Wood Roof Deck

(When Condensation is not a Factor)

Wood Deck

All loose boards should be securely fastened and any raised edges or sharp corners adzed smooth. The wood roof deck should be thoroughly cleaned of all loose materials and dirt.

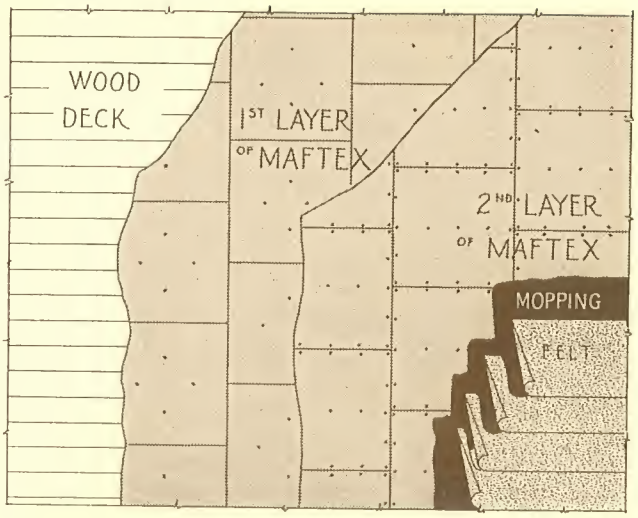
Application of MAFTEX

Apply MAFTEX Insulating Board to the entire surface of the roof, allowing ⅛″ clearance between all edges. Nail the center of the sheets at random to secure them in place and nail all edges 12″ on centers. Large head 1½″ roofing nails should be used and all nails should be driven home.

If more than one layer of MAFTEX is to be used, apply succeeding layers directly over the first layer, taking care that all joints are well staggered. Only the final layer need be nailed through to the wood roof deck and nails proportionately longer should be used.

MAFTEX should be neatly cut to fit around projections such as vent pipes, flag poles, etc., and at penthouses, walls, skylights, etc.

Any "standard" built-up roofing may be applied to the MAFTEX. If there is any possibility of the pitch or asphalt dripping through the wood roof deck, the wood deck should be covered with a sheet of rosin-sized paper or saturated felt before the MAFTEX is laid.



MAFTEX on Wood Roof Deck
(When Condensation is not a Factor)

Do not lay more MAFTEX than can be covered with roof covering in one day. Protect exposed edges of MAFTEX when work is stopped by a sheet of roofing paper weighted to hold it in place.

Architects' Short Form Specification

(For Inclusion in Roofing Contractors' Work)

The contractor for roofing shall furnish and apply ....layers of MAFTEX Roof Insulating Board to the wood deck before installing roofing. MAFTEX shall be applied in accordance with the directions of the maker, published on Page 56 of the MAFTEX Manual, dated 1928, and on file in the office of the architect.

Wood Roof Deck

(When Subject to High Humidities)

Wood Deck

All loose boards should be securely fastened and any raised edges or sharp corners adzed smooth. The wood roof deck should be thoroughly cleaned of all loose materials and dirt.

Water-Proof Paper

The entire roof area should be covered with a coated water-proof paper weighing not less than 7 pounds per square, lapped 6 inches and cut to form water-proof joints at wall angles. Nail sheet under lap enough to hold in place. If necessary, the bottom of each sheet may be nailed with galvanized nails and tin caps 20″ on centers.

Apply MAFTEX Roof Insulating Board over this water-proof course, allowing ⅛″ clearance between all edges. Nail the centers of the sheets at random to secure them in place and nail all edges 12″ on centers. Use large head 1½″ roofing nails.

When more than one layer of MAFTEX is to be used, apply succeeding layers directly over the first layer taking care that all joints are staggered. Only the final layer need be nailed through the deck, using nails proportionately longer.

MAFTEX should be neatly cut to fit around projections such as vent pipes, flag poles, etc., and at penthouses, walls, skylights, etc. Any "standard" built-up roofing may be applied to the MAFTEX.

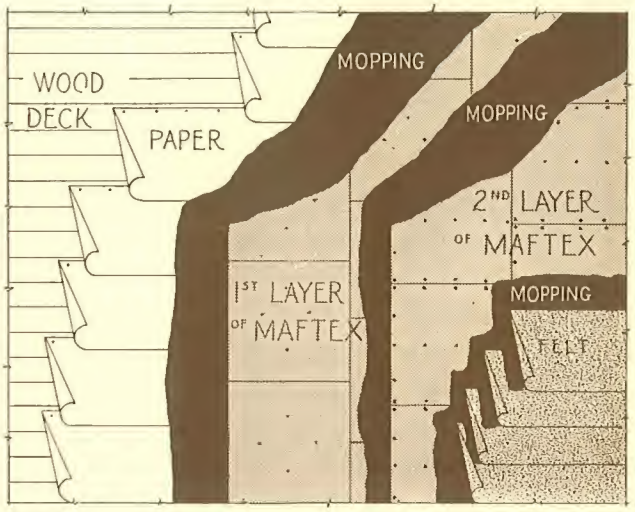
NOTE: *Under certain conditions it may be necessary to increase the amount of waterproofing by mopping uniformly over the waterproof paper and each succeeding layer of MAFTEX as shown in the drawing. The MAFTEX should be firmly imbedded in the mopping. The nailing shown may not be necessary on flat roofs when mopping is used but should be required wherever there is possibility of slipping.*

(For more severe conditions, consult MacAndrews & Forbes Company.)

Architects' Short Form Specification

(For Inclusion in Roofing Contractors' Work)

The contractor for roofing shall furnish and apply . . . .layers of MAFTEX Roof Insulating Board over



MAFTEX on Wood Roof Deck
(When Subject to High Humidities)

a waterproofing course of (here insert kind desired) on the wood deck before installing roofing. Waterproofing course and MAFTEX shall be applied in accordance with the directions of the maker published on Pages 56 and 57 of the MAFTEX Manual, dated 1928, and on file in the office of the architect.

NOTE: *The above does not include mopping or nailing. If conditions require, these should be inserted in the "Short Form."*

Unit Tile Deck

Unit Tile Deck

All joints should be carefully pointed and the entire roof deck thoroughly cleansed of loose materials and dirt. The deck should be examined by the roofing contractor and be in such condition as to be acceptable to him.

Application of MAFTEX

NOTE: *Under certain conditions of smoothness or absorption and with certain types of tile, it will be desirable to use a waterproof primer to facilitate a proper bond.*

Spot mop or strip mop tile units. Mopping should be kept back at least four inches from joints of the tiles.

NOTE: *If coal tar pitch is used or if there is any possibility of dripping through the joints a "Dry Sheet" of coated paper, lapped 6 inches should be laid over the entire surface.*

While the mopping is hot, imbed the MAFTEX thoroughly by pressing the entire surface to the deck. A space of ⅛" should be kept between all edges and the edges be well coated.

If more than one layer of MAFTEX is to be used, mop uniformly and completely the top surface of each layer. The joints should be well staggered and the boards thoroughly imbedded.

MAFTEX should be neatly cut to fit around projections such as vent pipes, flag poles, etc., and at penthouses, walls, skylights, etc.

Do not lay more MAFTEX than can be covered with roof covering in one day. Protect exposed edges of MAFTEX, when work is stopped, by a sheet of roofing paper weighted to hold it in place.

If waterproofing is not required, the MAFTEX Roof Insulating Board may be installed as described for wood deck roofs and the moppings omitted.

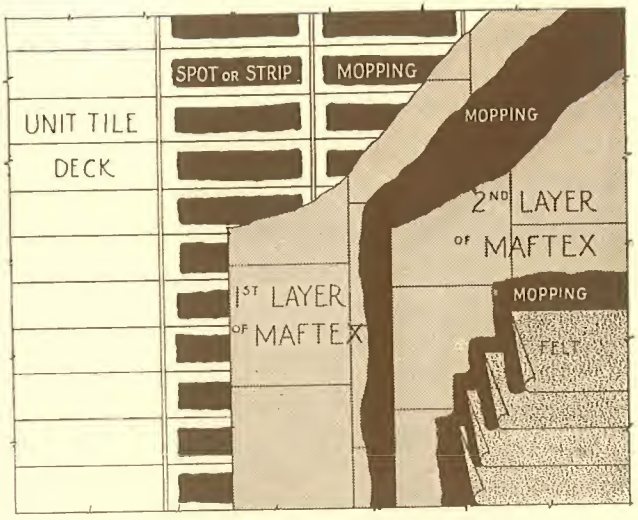
If the MAFTEX is to be installed on sloping roofs where there may be possibility of slipping, the sheets should be nailed or otherwise anchored.

Any "standard" built-up roofing may be applied to the MAFTEX.

Architects' Short Form Specification

(For Inclusion in Roofing Contractors' Work)

The contractor for roofing shall furnish and apply ....layers of MAFTEX Roof Insulating Board to the unit tile deck before installing roofing. MAFTEX shall be applied in accordance with the directions of the maker published on Page 57 of the MAFTEX Manual, dated 1928, and on file in the office of the architect.



MAFTEX on Unit Tile Deck

Metal Roof Deck

Metal Roof Deck

The metal roof deck should be properly installed in accordance with the directions of the manufacturer of the metal deck. It should be left free from rust, scale and oily spots and in a condition acceptable to the roofing contractor.

Application of MAFTEX

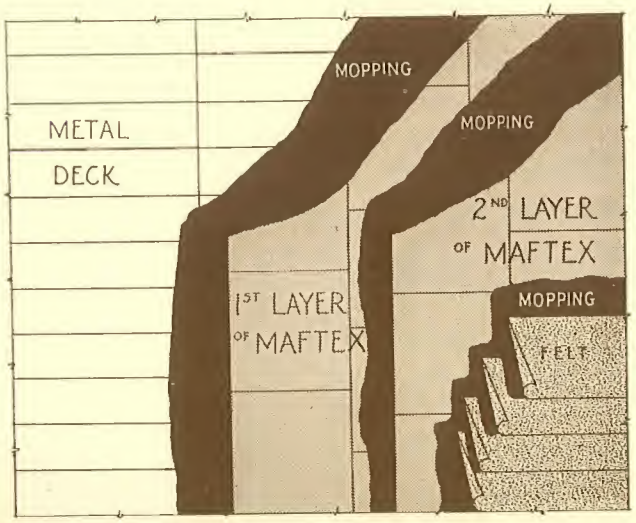
The deck should be well mopped with hot asphalt using not less than 25 lbs. per 100 sq. ft. of area and the MAFTEX Roof Insulating Board imbedded thoroughly by pressing the entire surface to the deck. A space of ⅛" should be kept between all edges and the edges well coated.

If more than one layer of MAFTEX is to be used mop uniformly and completely the top surface of each layer. The joints should be staggered and the boards imbedded in the hot asphalt.

MAFTEX should be neatly cut to fit around projections such as vent pipes, flag poles, etc., and at penthouses, walls, skylights, etc.

Do not lay more MAFTEX than can be covered with roof covering in one day. Protect exposed edges of MAFTEX, when work is stopped, by a sheet of roofing paper weighted to hold it in place.

Any "standard" built-up roofing may be applied to the MAFTEX.



MAFTEX on Metal Roof Deck

Architects' Short Form Specification

(For Inclusion in Roofing Contractors' Work)

The contractor for roofing shall furnish and apply ....layers of MAFTEX Roof Insulating Board to the metal roof deck before installing roofing. MAFTEX shall be applied in accordance with the directions of the maker published on Page 58 of the MAFTEX Manual, dated 1928, and on file in the office of the architect.

MAFTEX Roof Insulating Board

as a Base for Linoleum

(Directions for Application)

On Concrete

The surface of the concrete floor should be brought to a uniformly smooth finish. Allowance should be made for the thickness of the MAFTEX in finishing the concrete floor. All floor surfaces should be coated with a water-proof primer.

The concrete floor surface should next be covered with hot asphaltic cement or other approved water-proof cement and the MAFTEX completely imbedded therein with the smooth surface uppermost. Carefully press down all boards and weight with sand bags along the edges to assure adhesion. Sometimes a roller is used for this purpose. The upper surface of the MAFTEX must be kept clean of asphaltic cement. Do not force adjoining edges of the board into contact.

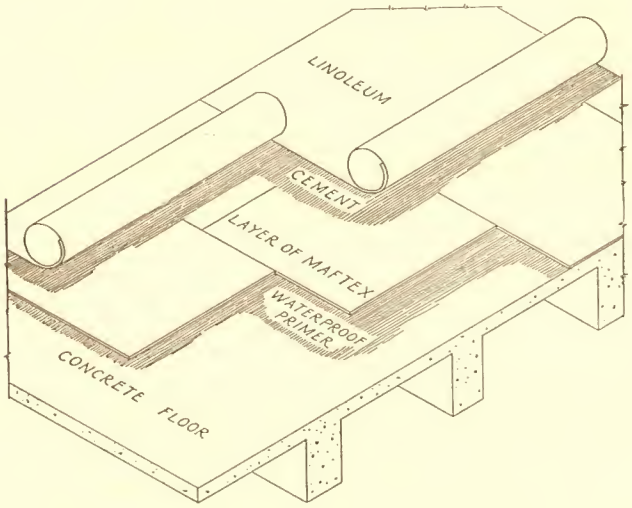
The linoleum should be laid in an approved brand of linoleum cement over the MAFTEX base in accordance with the directions of the manufacturer of the linoleum.

On Wood Floors

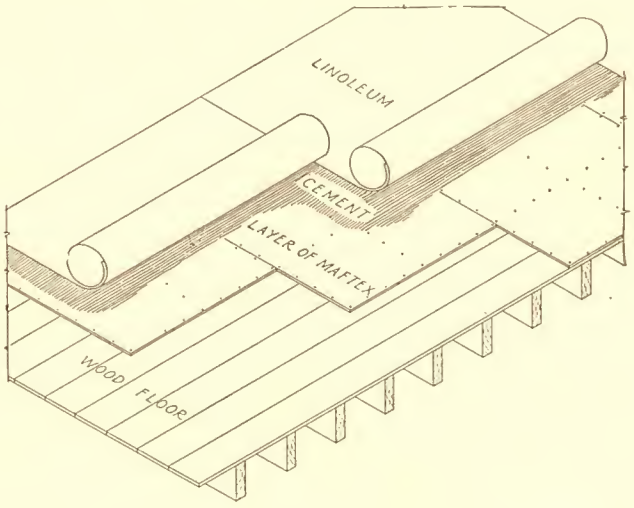
The wood sub-floor should be of matched and dressed tongued and grooved stock. The ends of flooring should be so cut that all joints occur over floor joist.

Over the wood floor lay MAFTEX Roof Insulating Board. Each board should be nailed with 4-penny shingle nails through the center and along all edges. Do not force adjoining edges of the Board into contact. MAFTEX shall be kept ½" away from all walls.

The linoleum shall be laid in approved brand of linoleum cement over the MAFTEX base in accordance with the directions of the manufacturer of the linoleum.



MAFTEX on Concrete Under Linoleum



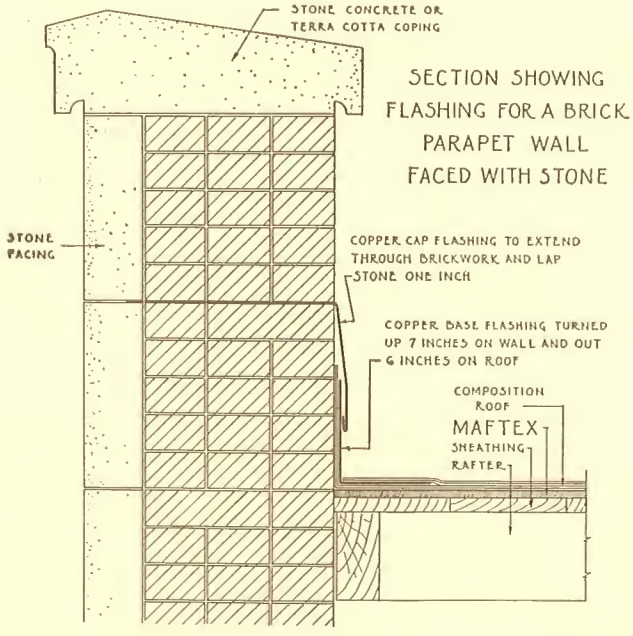
MAFTEX on Wood Under Linoleum

Related Data on Flat Roof Construction

The satisfactory results possible with any flat roof are dependent upon several factors, some of which are described in the succeeding paragraphs. Each of these should be given due consideration in detailing and specifying and the work of installation should be regularly and carefully inspected. The attention of the architect or engineer is called to the fact that for some roofs it may be necessary to include under the specifications for the work of related trades, items either a part of or having a bearing on the roof deck construction, flashings, drains, etc. Often much time will be saved and trouble avoided by carefully checking on this point.

Flashings

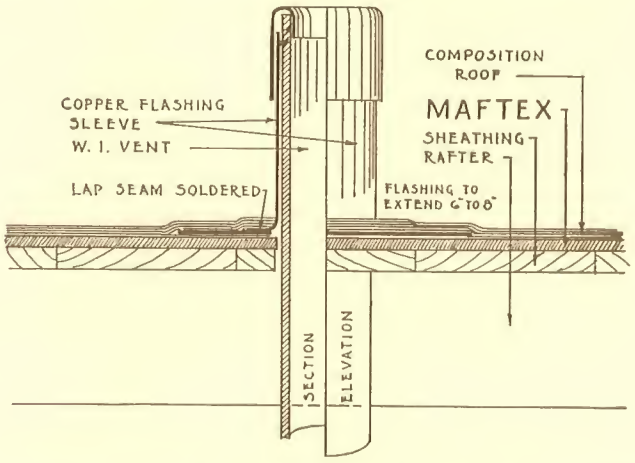
The material for flashings should be carefully selected and specified. The neglect of these often forms one of the weakest points of the roof. It is usually poor economy to use any but the most permanent materials and the best workmanship. This is particularly true when insulation is installed. Copper, lead, zinc, galvanized iron or tin are the usual flashing materials.



Flashing for a Brick Parapet Wall Faced with Stone
(Adopted from the Standards of the Copper and Brass Research Association)

Flashings should be used at all intersections of vertical or projecting surfaces through the roof or against which the roof abuts such as walls, skylights, chimneys, etc.

If the cap flashing is not to be built into the masonry the specification writer should make pro-



Flashing for Iron Vent with Copper Cap
(Adopted from the Standards of the Copper and Brass Research Association)

vision for the installation of flashing blocks. In any case, the mason and carpenter specification should include such provisions as may be necessary for related work.

In connection with the use of copper flashings over concrete, it is important that the surface be made as smooth as possible either by a wash of neat cement or by elastic cement. Flashing materials should never come in contact with cinder concrete but the concrete should be painted with a heavy coating of asphalt paint before the copper is applied.

On skylight or monitor curbs a flashing should be installed under the sill to take care of condensation which may form on the glass.

When vent pipes or flag poles pass through the roof covering, they should be flashed and counter flashed.

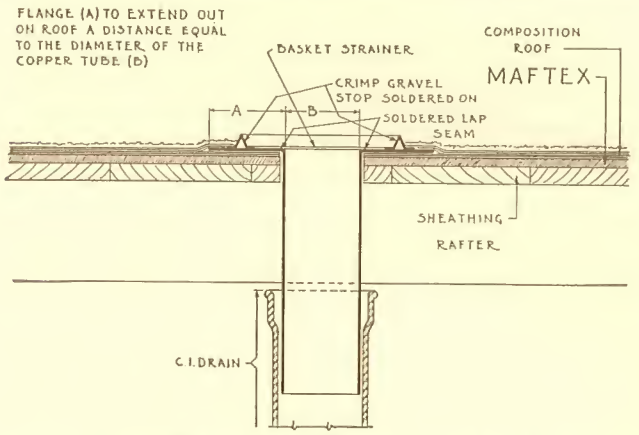
The Copper & Brass Research Association has, among others, made extensive studies of the problem of flashings and valuable data is presented in the Association's Handbook "Copper Flashings,"

which may be obtained by writing to the Association at 25 Broadway, New York City.

Roof Drains

Care should be exercised in selecting the roof drains to see that they are of such form and size as will carry off the water without delay or danger of "backing up." Such drains usually are furnished with flanges which provide all flashing necessary, but this is a point which should be investigated.

When flat roofs are enclosed by parapet walls and have inside drainage systems, it is most important that adequate scuppers be provided to carry off water in case of clogging of the drains. If this point is neglected and water collects not only may it leak into the building by overtopping the flashing



Flashing for a Roof Drain from a Flat Roof
(Adopted from the Standards of the Copper and Brass Research Association)

but the weight may be sufficient to cause danger to the roof. The scupper should be amply large (at least 4″ x 12″) and should not have screens or any other obstruction. Balconies, roof decks or other areas enclosed by wall or balustrade should be provided with scuppers.

Nailing and Cant Strips

Although not called for in the specifications it is sometimes advisable on roofs of large area to imbed a nailing block in a roof deck of concrete along all wall lines. The MAFTEX may then be nailed to this block. If this is to be done provisions for some should be made in the specifications for Concrete Work.

Cant strips, when provided, should be set on top of the MAFTEX. This applies wherever cant strips are installed.

Roofing

It will be noted that the specifications and directions call for the installation of MAFTEX Roof Insulating Board by the roofing contractor. This procedure is usually more satisfactory to all concerned as the contractor is then familiar with the condition of the base under the insulation and his responsibility is not divided with another contractor. The roofing contractor should not place insulation on any deck which is not in suitable condition to receive it.

Instructions for Use of Roof Condensation Chart

(See Page 63)

Required Data

To determine the number of layers of MAFTEX Roof Insulating Board required to prevent condensation the following data are required.

1—Inside air temperature near roof line.

2—Relative humidity near ceiling line.

3—Extreme difference in temperature between inside and outside air.

4—Transmission coefficient of the uninsulated roof.

With an exact knowledge of these four variables it is possible to calculate accurately the required insulation. Each is important, and the success or failure of the job will depend chiefly upon the accuracy with which they are determined.

When insulation is to be applied to existing roofs, the temperature and humidity data should be taken from actual observations made near the ceiling line. Readings should be taken at a number of points, and under atmospheric conditions favoring condensation.

In the case of a new building, assumptions must be made based on the use to which the building is to be put, and the design of the heating system. For external temperatures, statistics of the United States Weather Bureau may be used.

Procedure for Use of Condensation Chart

1—Using the upper section of the chart, locate the room temperature on the left hand scale. Project this value horizontally to the diagonal line indicating the relative humidity.

2—From the intersection found above pass downward to the horizontal line indicating the difference in temperature between the inside and outside air (as read on the left hand scale of the lower part of the diagram).

3—Connect the intersection last found by means of a straight line with the reference point "A," and extend this line until it intersects the scale marked "Required Transmission Coefficient of the Insulated Roof." This gives the required coefficient of the roof.

4—From the accompanying table at the foot of this page select the transmission coefficient of the uninsulated roof and locate the value on the right hand scale of the diagram.

5—Projecting the value of the required coefficient vertically, and the coefficient of the uninsulated roof horizontally gives a final intersection point. If this point falls between the curves indicating one and two layers of MAFTEX, two layers should be used; if between two and three layers, three layers should be used. If more than five layers are indicated it is recommended that a ventilating engineer be consulted.

HEAT TRANSMISSION
of Various Types of Uninsulated Roof Decks
(Expressed in B.t.u. per sq. ft. per degree F., per hour)

TYPE OF ROOF	Coefficient
Steel Deck	0.84
2″ Stone Concrete	0.70
3″ " "	0.65
4″ " "	0.60
6″ " "	0.52
8″ " "	0.47
2″ Cinder Concrete	0.49
4″ " "	0.35
6″ " "	0.27
8″ " "	0.22
2″ Stone Concrete with Cinder Fill	0.50
3″ " " " " "	0.47
4″ " " " " "	0.44
6″ " " " " "	0.40
8″ " " " " "	0.37
2″ Concrete 2″ Hollow Tile	0.42
2″ " 4″ " "	0.33
2″ " 6″ " "	0.27
2″ " 8″ " "	0.23
4″ " 2″ " "	0.38
4″ " 4″ " "	0.30
4″ " 6″ " "	0.25
4″ " 8″ " "	0.22
1″ Wood Plank (⅞″)	0.49
1½″ " " (1¼″)	0.39
2″ " " (1¾″)	0.35
2½″ " " (2¼″)	0.28
3″ " " (2¾″)	0.26

Example

It is required to determine the number of layers of MAFTEX Roof Insulating Board to prevent condensation on the underside of a 2″ concrete roof deck. Temperature and humidity conditions are as follows:

Inside tempertaure near ceiling line—66°.

Relative humidity near ceiling line—60%.

Temperature of outside air—12° below zero.

This gives a difference in temperature between the inside and outside of 78°.

Reference to the table shows that a 2″ stone concrete deck has a coefficient of 0.70 B.t.u.

A graphic solution of the problem is indicated by the broken black lines on the diagram. The order of procedure is as follows:

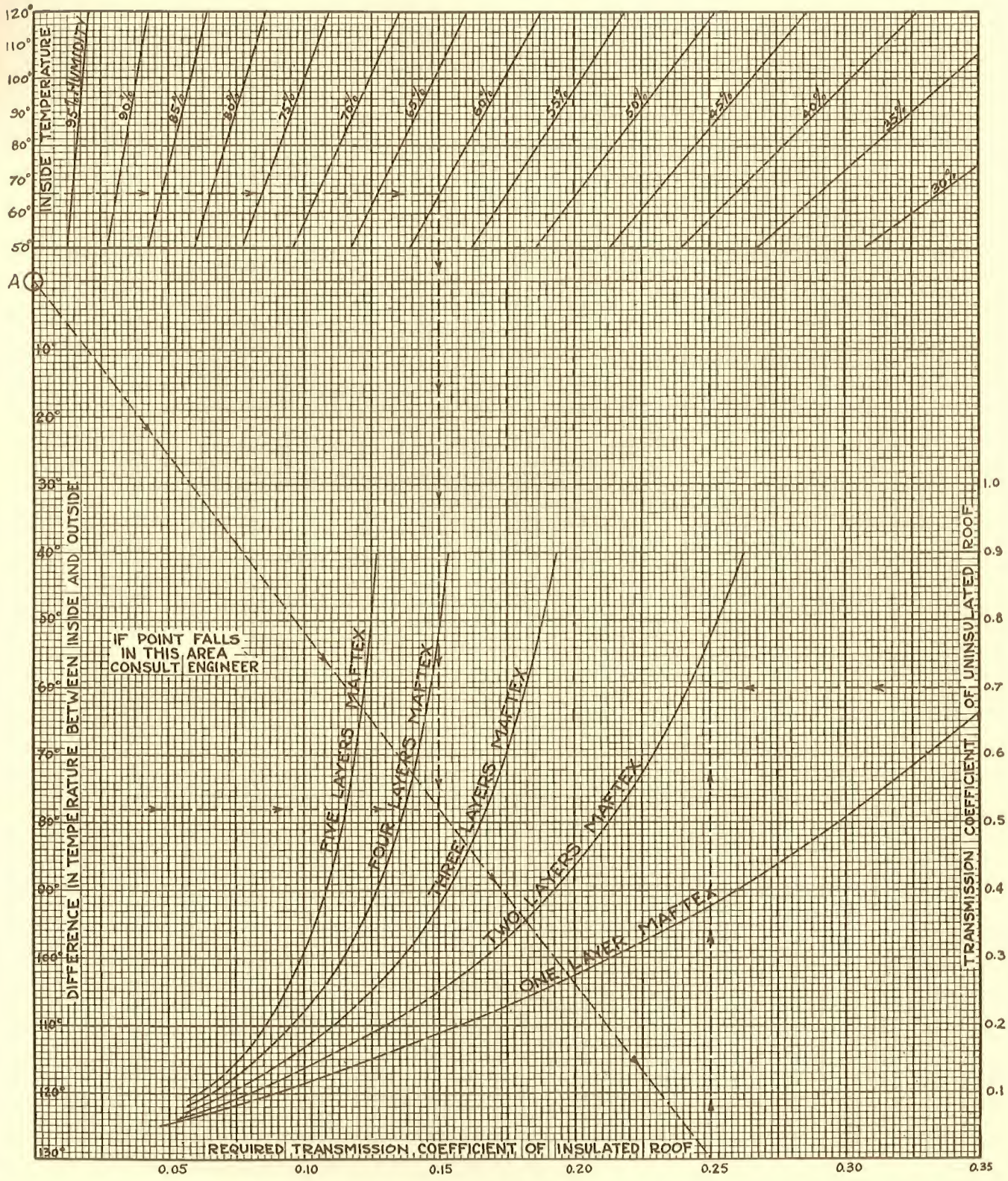
1—Locate the inside temperature (66°) on the upper left hand scale, and extend this horizontally to the diagonal line indicating 60% humidity.

2—Locate the temperature difference (78°) on the lower left-hand scale. Project this value horizontally to the right until it intersects the vertical line carried down from the intersection found in the upper part of the diagram.

3—Connect the intersection last found with point "A" by means of a straight line. This line continued to its point of intersection with the scale marked "Required Transmission Coefficient of the Insulated Roof" gives a value of 0.25 B.t.u.

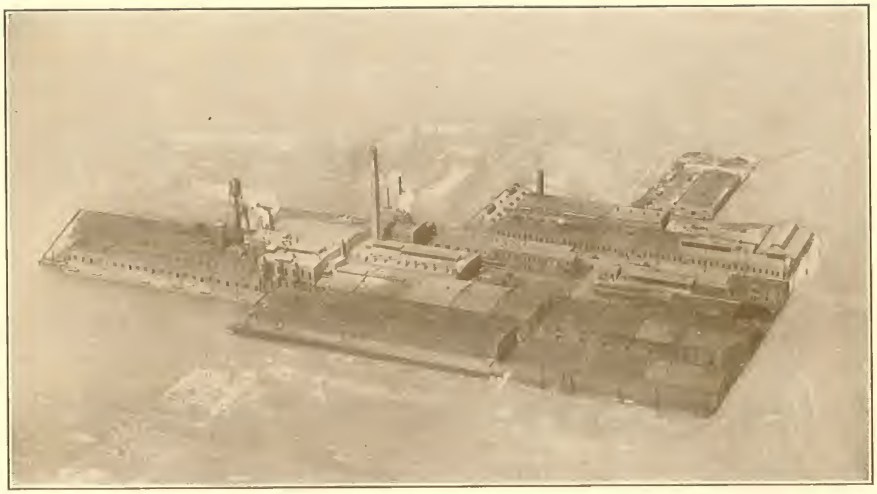
4—Locate the coefficient of the uninsulated roof (0.70 B.t.u.) on the right-hand scale.

5—Projecting vertically from the coefficient of the insulated roof (0.25 B.t.u.) and horizontally to the left from coefficient of the uninsulated roof (0.70 B.t.u.) gives an intersection between one and two layers of MAFTEX. Two layers should be used.



CONDENSATION CHART

See page 62



AIRPLANE VIEW OF MACANDREWS & FORBES PLANT IN CAMDEN, N. J.

For any additional or special information about MAFTEX or MAF-LATH applications write to

MACANDREWS & FORBES COMPANY

Business Established in U. S. A., 1870

200 FIFTH AVENUE, NEW YORK

PRINTED IN U.S.A.